Nurturing Nigeria's Prosperity: Harnessing Green TVET for Sustainable Development

[1] **Latifat Iyabo Akindele, [2]Rasaki Akanni Raji & [3]Rashidat Olayemi Olabimtan**

[1&2] Department of Business Administration and Management, Federal Polytechnic Ilaro, Ogun State, Nigeria,
[3]Department of Maritime Transportation and Business Studies, Federal Polytechnic Ilaro, Ogun State, Nigeria

E-mail: latifat.akindele@federalpolyilaro.edu.ng, rasaki.raji@federalpolyilaro.edu.ng, rashidat.olabimtan@federalpolyilaro.edu.ng

Abstract

This study examined the effect of green TVET in nurturing sustainable development in Nigeria focusing on staff (Lecturers, Technicians, Technologies, and Instructors) of four (4) TVET institutions in Ogun state. A descriptive survey approach was adopted. Using a purposive sampling technique, a quota of 100 staff was assigned to each school leading to a total population of 400 staff for this study. The sample size of 383 staff was determined via Taro Yamane sampling techniques. A 20-items questionnaire with four-point Likert scale was used to gather information on Green Curriculum and Technology (GCT), Green Campus (GCa), Green Culture (GCu), and Environmental Sustainability (ES). Validity and reliability test were evaluated using component factor analysis and cronbach's alpha statistic respectively. Multiple linear regression was employed to analyze the data. The study concluded that there is a significant relationship between green TVET and sustainable development in Nigeria. The study recommended that TVET institutions should guarantee green sustainability components are integrated into TVET curricula; campus-wide sustainability programs should be emulated; and TVET tertiary institutions should implement adequate law and order to support green cultural practice.

Keywords: Environmental Sustainability, Green Curriculum and Technology, Green Culture, Green Campus

Introduction

Achieving sustainable development in developing countries has been a daunting task. This is because emerging countries, particularly Nigeria, appear to have undervalued human development as a key predictor of sustainable development. Human development is about establishing an environment in which people can reach their maximum potential while meeting their needs. Education and training have long been regarded as key linchpins in providing experts and skills needed to adapt to changes in the surroundings. Technical and vocational education and training is the master key to creating an environment that will improve everyone's quality of life and contribute to sustainable growth. TVET is essential for attaining sustainable development since it gives people the knowledge, skills, and competences needed to succeed in the workforce and support the long-term growth of their country (Akamobi, 2022).

There is still a big gap in the application of sustainable development practices and environmental sustainability in Technical and Vocational Education and Training (TVET) systems, especially in Nigeria, despite the growing recognition of these concepts on a global scale. The lack of comprehensive green TVET initiatives creates a number of difficulties and impediments to achieving sustainability goals, including low institutional capacity, inadequate curriculum integration, policy and regulatory limitations, and sociocultural factors.

Devoted teachers in technical and vocational education will help generate labor for connected fields. Numerous significant environmental issues were brought on by the usage of fossil fuels, pollutants from outdated equipment, and industrial waste. Therefore, technical personnel may contribute to environmental pollution and climate change if they are unable to learn new technologies and carry out their jobs in an environmentally sustainable manner (Hiddayah, et al., 2019). Thus, it is crucial to train highly qualified workers who have the ability and awareness to safeguard the environment. Without competent vocational teachers, this goal cannot be accomplished because vocational students' academic performance is strongly impacted by the caliber of vocational teachers (Zubir et al., 2020).

The conversation on environmental sustainability has become increasingly prevalent in a number of global sectors in recent years. Institutions of Technical and Vocational Education and Training (TVET) are essential in molding the knowledge and abilities of future professionals, especially in areas where environmental sustainability is directly affected. Still, there is a lack of knowledge regarding how green practices are incorporated into TVET courses and how well they work to encourage students to practice environmentally conscious behavior.

The issue at hand is the necessity of doing a thorough analysis of the state of green TVET programs today and how they affect environmental sustainability. Though the value of sustainable practices is becoming more widely acknowledged, little study has been done to thoroughly assess how well green ideas are incorporated into TVET programs, what obstacles are faced, and what results are obtained (Mungai & Sigo, 2016).

The objectives of the study are to evaluate how Ogun State's green curricular initiatives are advancing sustainability, to investigate the effect of green campus on students' environmental conservation-related knowledge, abilities, and attitudes, and to evaluate how well green culture assist in putting green TVET projects into practice and attaining sustainability in Ogun State.

Green TVET

In Nigeria, Technical and Vocational Education and Training (TVET) plays a significant role in producing technicians, technologists, and engineers who are employed in the informed sector and by companies. The formal, informal, and non-formal systems are included in it. Universities, polytechnics, monotechnics, technical colleges, colleges of education, and other specialized institutions such as vocational enterprise institutes offer the formal system. On the other hand, programs created, administered, and overseen by public and commercial entities with the aim of meeting particular needs are classified as non-formal TVET. The apprenticeship programs offered by roadside mechanics, blacksmiths, carpenters, painters, and electrical/electronic technicians are the primary means by which the informal system operates (Akamobi, 2022).

With practical training and work experience, TVET programs at all levels seek to produce a trained workforce that is appropriate and sufficient to respond to changes in their communities and act as a catalyst for such changes. This means that TVET colleges can meet the various training requirements of students from various academic and socioeconomic backgrounds and get them ready for gainful employment and a long-term source of income.

In order to be able to adapt to the changes that occur around them, people require certain information, skills, and attitudes, which is why education and training are so important. In particular, TVET continues to have the best chance of both reducing the mismatch between the supply and demand of skills, and the skill gap between technology and skill. TVET creates a trained, dedicated, and driven workforce that comprehends how global changes affect local business and industry opportunities as well as how these changes affect the standard of social, economic, and environmental situations (UNESCO, 2019). As previously stated, the primary goals of Technical and Vocational Education and instruction (TVET) are to supply skilled laborers, technicians, and technologists at all economic levels by means of hands-on instruction and work experience.

TVET potential's applicability to the workforce is crucial. However, skill mismatches, which are

growing across the globe rather than shrinking, pose a threat to its relevance. TVET is under pressure to provide students with the skills necessary for their new job environments, which supports this point of view. To put it another way, TVET must be both proactive (starting change based on anticipated work demands and lifetime opportunities) and reactive (developing knowledge and skills relevant to the job that people hold or recently hold). This is why TVET must be transformed for sustainable development (World Bank, 2014).

In the TVET sector, greening TVET is seen as one of the comprehensive frameworks for a seamless transition to a sustainable and low-carbon world. A suggested framework for securing sustainable development principles in TVET institutions is one that is based on five dimensions. The first dimension is known as the "Green Campus," and it is predicated on the idea of controlling campus resources like electricity, water, and garbage by doing as one preaches. The goal of this dimension is to lessen the TVET institutions' personnel, teachers, and students' carbon footprints. In order to address the need for future skills for clean and green jobs, the second component discusses programs on green curriculum and technology. The third dimension places a lot of emphasis on the necessity of creating a green community in order to expand sustainable development practices at the local level and broaden the reach of TVET institutions into the general public. In order to promote the growth of a research culture in pertinent areas of sustainable development, the fourth pillar focuses on green research. Fifth, the goal of fostering a green culture is to reinforce moral education, ethical norms, attitudes, and conduct that respects natural resources and appreciates the needs of the next generation (Jahonga *et al.*, 2015).

Green Curriculum and Technologyy

One crucial component of schooling is the curriculum. Its creation is the result of systematic, well-planned attempts to provide educational experience for students that is accountable to the school. Precisely, the perception of curriculum in general is not merely in the form of courses or learning activities of students, but it denotes to every element affected students' character building in accordance to intended education goals (Jaya, 2020). It describes the subjects taught in educational institutions as well as their layouts.

The term "green curriculum" describes methodical modification and adaptation of the curriculum as well as pedagogical/didactical applications, methodologies, and approaches to effectively transmit skills that are applicable to both work and life and that satisfy current job standards and job profiles in the labour market.

"Green technology aims at reducing environmental damage created by products and technologies for human conveniences," (Jahonga et al., 2015). It has the potential to boost agricultural income while halting environmental deterioration, protecting natural resources, and supplying affordable renewable energy derived from the sun, wind, tides, and waves in the sea, as well as biogas and biofuels. Such a utilization of goods, machinery, and systems helps to preserve the environment and natural resources. By doing this, the effects of human activity on the environment will be reduced. The need for this technology is universal while the survival of mankind requires sustainable development. Green investments have the potential to be important job creators, especially in the areas of eco-construction and renewable energy (Jahonga *et al.*, 2015).

The world of work is rapidly changing due to the impact of technology on labor requirements and occupational demand patterns. The changes brought about by technological advancements have an impact on the demands for skills, changing the skill profiles of and within occupations, which has an impact on the need for and delivery of training. Due to these developments, both learners and workers who are currently employed must keep up with new technological capabilities, market demands, and legal requirements specific to their industry and business (ILO, 2015).

Green Campus

A "green campus" is defined as a higher education community that "creates healthy living and learning environments, improves energy efficiency, conserves resources, and enhances environmental quality through sustainability education." Outreach, teaching,

research, and operations are the four primary components that a green campus should be able to reflect. The creator of a green campus must comprehend the opinions of the stakeholders in order to construct one (Rosidah & Nathania, 2023)

An educational institution that places a high priority on resource efficiency, sustainability, and environmental preservation in all aspects of its operations is referred to as a "green campus," eco-friendly campus, or sustainable campus. According to AASHE, it acts as a model for incorporating sustainability into research, teaching, and campus life

An organization's or community's overall beliefs, attitudes, actions, and customs that place a high priority on environmental sustainability and stewardship are referred to as having a "green culture." It entails incorporating sustainable concepts into everyday operations, decision-making procedures, and activities in order to reduce environmental impact and advance a more sustainable future.

Green culture is defined as "a way of life in which conscious decisions are made about the resources used for everyday needs in an effort to minimize resource usage (Okanazu & Akele, 2021). It is the application of regenerative resources. It discourages the use of plastic bottles produced of nonrenewable resources and chemicals that are bad for the environment and promotes the use of recycled paper and biodegradable items whenever available. According to this study, green culture refers to business practices that organisations should implement to run their operations in a way that it's environmentally friendly, less wasteful of resources, and less destructive to society.

Sustainable Developmentt
Development that meets present needs without endangering the capacity of future generations to meet their own is known as sustainable development. Living within the confines of what the environment can offer and realizing the linkages between the economy, society, and opportunities are all part of this development. Sustainable development is the process of expanding the array of chances that will allow people to realize their goals and potential over an extended period of time while preserving the

resilience of the social, economic, and environmental systems (Abubaka, 2013).

Kolb's Experiential Learning Theory
David Kolb developed the Experiential Learning Theory in 1984, which offers a thorough framework for comprehending how people learn by experience. TVET has extensively employed the idea, which incorporates the four-stage cycle of learning to create curricula and instructional practices that involve students in experiential learning. The four stages of learning, according to the theory, are abstract conception, active experimentation, reflective observation, and concrete experience.

Innovation Ecosystems Theory
James F. Moore developed the Innovation Ecosystems Theory in 1993. It offers a comprehensive framework for comprehending the intricate webs of individuals, organizations, and resources that support entrepreneurship and innovation in a particular sector or area. Innovation ecosystems are vital to the evolution of technology, economic growth, and social progress because they promote cooperation, knowledge exchange, and resource access. Innovation ecosystems will continue to develop, adapt, and flourish as the world economy grows more linked and complicated. This will spur innovation and influence industries and communities all around the world.

Sustainability Education Theory
The theory of sustainability education places great emphasis on the cultivation of knowledge, values, and abilities that enable individuals to make meaningful contributions towards a society that is both sustainable and equitable. This theory aims to advance knowledge of sustainability issues and solutions at the local, regional, and global levels by acknowledging the interdependence of environmental, social, and economic systems

A study by Zubir et al. (2020) investigated the components of green skills for technical and vocational education training (TVET) teaching and learning (T&L). The study design used in the research was qualitative. The investigators conducted interviews with three lecturers with backgrounds in construction technology and T&L. A matrix analysis method was applied to the data analysis. The study

recommended that in the future, T&L instructors should incorporate more elements related to green skills.

Materials and Methods

The effect of green TVET on sustainable development was examined in this study. The study adopted a descriptive survey design. The study concentrated on the employees of four TVET institutions in Ogun state: Federal Polytechnic Ilaro; Federal University of Agriculture, Abeokuta; Moshood Abiola Polytechnic, Abeokuta; and Tai Solarin University of Education, Ijebu-Igbo. The employees included lecturers, technicians, technologists, and instructors in the entrepreneurial education center. Using purposeful selection techniques, 400 employees were chosen from these institutions, with a quota of 100 allotted to each school. Important information on Green Curriculum and Technology (GCT), Green Campus (GCa), Green culture (GCu), and Environmental

Sustainability (ES) was gathered using a 25-item questionnaire with a four-point Likert scale. Cronbach's alpha statistics were used to evaluate the reliability of the instrument, whereas component factor analysis was used to evaluate its validity. To assess the data, multiple linear regression was employed. To aid in analysis and act as a guide, the model was defined as follows:

$ES = f(GT)$
$ES = \beta_0 + \beta_1 X + \beta_2 X + \beta_3 X \ldots\ldots\ldots et$
$ES = = \beta_0 + \beta_1 GCT + \beta_2 GCa + \beta_3 GCu \ldots\ldots\ldots et$
Where:
ES = Environmental Sustainability Skill
GT = Green TVET
GCT = Green Curriculum and Technology
GCa = Green Campus
GCo = Green Culture
B_0 = Constant
B_1, B_2, B_3 = Coefficient of correlation

Results and Discussion

Table 1: Reliability Statistics

Cronbach's Alpha	No of Items
.939	20

Source: Researchers' Computation, 2024.

An estimated alpha value of 0.939 was shown in Table I. This suggests that the measurement tool employed in the research was dependable and regularly measures the intended variable.

Table 2: Descriptive Statistics

	Mean	Std. Deviation	N
ES	11.0966	4.89080	383
GCT	9.1619	3.88647	383
GCa	8.8590	3.90944	383
GCu	7.8225	3.79374	383

Source: Researchers' Computation, 2024

A brief overview of the data used in this study was displayed in table II. The variables, green curriculum and technology (GCT), green campus (GCa), and green culture (GCu), had mean scores of 9.1619, 8.8590, and 7.8225, respectively, whereas

environmental sustainability (ES) had a mean score of 11.0966. ES had a standard deviation of 4.89080, while GCT, GCa, and GCu had standard deviations of 3.88647, 3.90944, and 3.79374, respectively

Table 3: Correlations

		ES	GCT	GCa	GCu
Pearson Correlation	ES	1.000	.620	.545	.236
	GCT	.620	1.000	.762	.647
	GCa	.545	.762	1.000	.548
	GCu	.236	.647	.548	1.000
Sig. (1-tailed)	ES	.	.000	.000	.000
	GCT	.000	.	.000	.000
	GCa	.000	.000	.	.000
	GCu	.000	.000	.000	.
N		383	383	383	383

Source: Researchers' Computation, 2024

Table 3 presents the correlations between green TVET (GCT, GCa, and GCu) and environmental sustainability which are 0.620, 0.545, and 0.236, respectively. This suggests that there is a strong correlation between ES and GCT, GCa, and GCu.

Table 4: Model Summary

a. Predictors: (Constant), GCu, GCa, GCT
b. Dependent Variable: ES
Source: Researchers' Computation, 2024

The R-square value of the model summary is 0.450 ($R^2 = .450$) in table 4. This suggests that about 45% of may be jointly attributed to green curriculum and technology, green campus, and green culture.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change
1	.671[a]	.450	.445	3.64232	.450	103.253

the overall variation in environmental sustainability

Table 5: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4109.418	3	1369.806	103.253	.000[b]
	Residual	5028.008	379	13.267		
	Total	9137.426	382			

a. Dependent Variable: ES a. Dependent Variable: E
a. Dependent Variable: ES
b. Predictors: (Constant), GCu, GCa, GCT
Source: Researchers' Computation, 2024

According to t-statistic table, the significant level of 0.000 is less than 5% ($p < 0.05$). This shows that, with a 95% confidence interval, the alternative hypothese were significant effect on environmental sustainability objectes. This suggests that green TVET has a major significant effect on the hypotheses

Table 6: Coefficients[a]

a. Dependent Variable: ES
Source: Researchers' Computation, 2024

The above table shows the regression equation revealing Beta of 4.262 and standard error of .509. The

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	4.262	.509		8.365	.000
	GCT	.824	.082	.655	10.083	.000
	GCa	.266	.074	.212	3.586	.000
	GCu	-.393	.065	-.304	-6.053	.000

T-value of .8.365 and P-value of 0.000 indicate that

green TVET has a statistically significant effect on environmental sustainability. Hence, the null hypothesis was rejected.

Table 7: Total Variance Explained

Source: Researchers' Computation, 2024

A cumulative total variance explained of 68.36% as seen in this table. This suggests that the questionnaire's items are well-loaded and capture the relevant information.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.444	47.220	47.220	9.444	47.220	47.220
2	2.870	14.350	61.569	2.870	14.350	61.569
3	1.358	6.788	68.357	1.358	6.788	68.357
4	.987	4.935	73.292			

Green campus initiatives programs and campaigns that involve lecturers, staff, students, and the local community should be put in place in order to promote environmental stewardship; and offer opportunities for experiential learning and involvement in sustainability projects.

Conclusion and Recommendation

Based on the findings, it was discovered that there is a significant relationship between green TVET and environmental sustainability. Green TVET promotes sustainable economic growth, lessen environmental damage, and improve social fairness by putting an emphasis on environmentally friendly practices and skill development.

Based on this finding, the study recommended that:

Nigeria government should encourage innovation, competitiveness, and resilience by providing targeted investments in green skills training, curriculum development, and infrastructure.

TVET tertiary institutions should implement adequate laws and order to support green cultural practices in their business operations ought to be passed by the government. Furthermore, government should raise a generation of environmentally aware individuals by fostering an environmental stewardship culture within its educational and vocational institutions.

TVET tertiary institutions should equally provide equipment that would enable their staff to implement green TVET practices in the organizations.

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