# Strategic Adaptation of Sustainable TVET Practices in Automobile Technology to Mitigate Global Economic Challenges

by
[1]Wahab Babatunde Habeeb, Aliyu Abdulrasak & Kehinde Ajiboye
[1 & 2] TECHNICAL EDUCATION DEPARTMENT
KWARA STATE COLLEGE OF EDUCATION
ILORIN

[3]TECHNICAL EDUCATION DEPARTMENT
KWARA STATE COLLEGE OF EDUCATION (TECHNICAL)
LAFIAGI, NIGERIA

**Correspondence:** khhart6@gmail.com

**Abstract**
*The study examined strategic adaptation of sustainable TVET practices in automobile technology to mitigate global economic challenges with the aims at examining the impact of curriculum relevance of automobile technology on employment opportunities; explore the impact of industry-academia collaboration through automobile technology on economic resilience; and investigate the impact of sustainability and innovation in training methodsof automobile technology on skill development and workforce productivity in Kwara State, Nigeria. The study adopted descriptive survey research design. The population of the study comprises 1933 students and 10 lecturers/technologists in the University of Ilorin, Ilorin from which a sample of 140 respondent was randomly selected. Z-test statics was used to analyse three hypotheses formulated at 0.05 level of significance. The study revealed that curriculum relevance of automobile technology significantly impacts employment opportunities in Kwara State; industry-academia collaboration through automobile technology significantly impacts economic resilience in Kwara State; and sustainability and innovation in training methodsof automobile technology significantly impact skill development and workforce productivity in Kwara State. It is concluded that strategic adaptation of sustainable Technical and Vocational Education and Training (TVET) practices in automobile technology is essential for mitigating global economic challenges. The study recommends curriculum planners for automobile technology should make it relevant to impart job skills in students.Educational institutions and industries in Kwara State should strengthen partnership bond, and instructors and trainers should receive ongoing professional development.*
**Keywords:** Sustainable TVET, Automobile Technology, Economic Resilience, Industry-Academia Collaboration, Workforce Development

## Introduction

Technical and Vocational Education and Training (TVET) is a specialized educational approach focused on imparting practical skills and knowledge for specific trades or professions, blending theoretical learning with hands-on training to ensure graduates are industry-ready (Tyowuah & Chen, 2019). TVET programs have proven effective in enhancing employability, fostering economic growth, and reducing unemployment, particularly in youth populations (Olubiyi & Afolabi, 2021). Countries like the UK, Japan, and Germany have harnessed TVET for economic advancement, indicating its potential to drive sustainable growth. In Nigeria, TVET is critical for curbing unemployment and fostering a self-sustaining economy. However, adapting TVET to Nigeria's unique socio-economic conditions is essential, especially through curriculum updates that reflect modern industry needs and sustainability.

Strategic adaptation within TVET involves updating curricula, infrastructure,

and teaching methodologies to match local industry requirements and global technological advancements. Sustainable TVET practices incorporate principles of environmental consciousness, social responsibility, and economic viability, equipping graduates with skills to meet contemporary workforce demands (Ochola & Kavinda, 2019). In the Nigerian context, sustainable TVET in fields like automobile technology can drive local innovation and reduce reliance on imports. Local automotive manufacturing, led by companies like Innoson, offers an opportunity for job creation, economic growth, and reduced import dependency, aligning with government policies aimed at fostering domestic production (Labe, 2023).

A well-aligned TVET curriculum in automobile technology bridges the skills gap, making graduates employable and ready for industry demands, fostering job creation and investment. Industry-academia collaboration also plays a pivotal role by aligning educational programs with industry needs, thus enhancing economic resilience and competitiveness. Innovative training methods, such as eco-friendly practices and advanced simulations, prepare the workforce for the demands of an evolving global market, ensuring Nigeria's competitiveness and sustainability in the automotive sector (Alamsjah & Yunus, 2022).

This research is based on the assumption that strategic adaptation of sustainable TVET practices in automobile technology will mitigate global economic challenges. Specifically, it seeks to:

1. examine the impact of curriculum relevance of automobile technology on employment opportunities in Nigeria;
2. explore the impact of industry-academia collaboration through automobile technology on economic resilience in Nigeria; and
3. investigate the impact of sustainability and innovation in training methods in automobile technology on skill development and workforce productivity in Nigeria.

**Hypotheses**

1. Curriculum relevance of automobile technology has no significant impact on employment opportunities in Kwara State.
2. Industry-academia collaboration through automobile technology has no significant impact on economic resilience in Kwara State.
3. Sustainability and innovation in training methods in automobile technology has no significant impact on skill development and workforce productivity in Kwara State.

**Methodology**

The study employed a descriptive survey research design. The population of the study consisted of 193-year III students and 10 automobile technology lecturers and technologists in the University of Ilorin, Ilorin. Year III students were considered appropriate for the study due to their completion of industrial training at the end of Year II. Taro Yamane formula for sample size, $n = \left(\frac{N}{(1+N(e)^2)}\right)$, was used to determine the sample of students, that is, 130 students, while the entire 10 automobile technology lecturers and technologists were included in the 140 respondents.

A structured questionnaire was used as research instrument to collect data from the respondents. The instrument's reliability was determined by a pilot study. Fifty copies of questionnaire was administered twice to 50 students of Kwara State University, Malete within two weeks interval. Cronbach Alpha reliability statistics was used to test the instrumentand the coefficient obtained was 0.86. Thus, the instrument is considered reliable enough.Statistical Package for the Social Sciences version 19 was used for data analysis. The null hypotheses were tested using z-test statistics at 0.05 level of significance. The z-test statistics were deemed appropriate for this study because the sample size exceeded 30, while maintaining the same parametric assumptions, table usage, and other

conditions as in the application of t-test statistics (Anupama, 2023).

**Decision Rule:**

Hypothesis is accepted when the z-calculated (z-cal.) value is less than z-table (z-critical) value of ± 1.96 and p-value is greater than 0.05 (level of significance), otherwise; the hypothesis is rejected.

**Results**

The results were presented in tables in line with the research questions and hypotheses.

**Table 1: Z-test analysis of impact of curriculum relevance of automobile technology on employment opportunities in Kwara State**

| Variable | Sample Size (n) | Sample Mean ($\bar{X}$) | Population Mean ($\mu$) | Standard Deviation ($\sigma$) | Z-Score | p-Value |
|---|---|---|---|---|---|---|
| Curriculum relevance | 140 | | | | | |
| | | 3.5 | 3.0 | 0.8 | 4.38 | 0.00001 |
| Employment opportunities | 140 | | | | | |

5% significance level (α = 0.05) for a two-tailed test.

Table 1 shows the impact of curriculum relevance of automobile technology on employment opportunities in Kwara State.The z-score, 4.38, is greater than zero, indicating a substantial deviation from the null hypothesis. Also, the p-value of 0.00001 is less than 0.05, meaning the test result is statistically significant. Therefore, since the p-value is below the significance level (α = 0.05), we reject the null hypothesis, concluding that the curriculum relevance of automobile technology has a significant impact on employment opportunities in Kwara State.

**Table 2: Z-test analysis of impact of industry-academia collaboration through automobile technology on economic resilience in Kwara State**

| Variable | Sample Size (n) | Sample Mean ($\bar{X}$) | Population Mean ($\mu$) | Standard Deviation ($\sigma$) | Z-Score | p-Value |
|---|---|---|---|---|---|---|
| Industry-academia collaboration | 140 | | | | | |
| | | 3.7 | 3.0 | 0.9 | 5.18 | 0.00001 |
| Economic resilience | 140 | | | | | |

5% significance level (α = 0.05) for a two-tailed test.

Table 2 reveals the impact of industry-academia collaboration through automobile technology on economic resilience in Kwara State. The z-score, 5.18, is greater than zero, indicating a substantial deviation from the null hypothesis. Also, the p-value of 0.00001 is less than 0.05, meaning the test result is statistically significant. Consequently, since the p-value is below the significance level (α = 0.05), we reject the null hypothesis, concluding that industry-academia collaboration through automobile technology has a significant impact on economic resilience in Kwara State.

**Table 3: Z-test analysis of impact of sustainability and innovation in training methods of automobile technology on skill development and workforce productivity in Kwara State**

| Variable | Sample Size (n) | Sample Mean ($\bar{X}$) | Population Mean ($\mu$) | Standard Deviation ($\sigma$) | Z-Score | p-Value |
|---|---|---|---|---|---|---|
| Training methods | 140 | | | | | |
| | | 3.8 | 3.0 | 0.85 | 6.25 | 0.00001 |
| Skill development and productivity | 140 | | | | | |

5% significance level (α = 0.05) for a two-tailed test.

Table 3 shows the impact of sustainability and innovation in training methods of automobile technology on skill development and workforce productivity in Kwara State. The z-score, 6.25, is greater than zero, indicating a substantial deviation from the null hypothesis. Also, the p-value of 0.00001 is less than 0.05, meaning the test result is statistically significant. Consequently, since the p-value is below the significance level (α = 0.05), we reject the null hypothesis. This indicates that sustainability and innovation in training methods of automobile technology have a significant impact on skill development and workforce productivity in Kwara State.

## Discussion

The results of the analysis reveals that curriculum relevance of automobile technology has significant impact on employment opportunities in Kwara State (z-score = 4.38 > 0; p-value = 0.00001 < 0.05). This finding coincides with the assertion of Thomas, Amaechi and Bassey (2023) who emphasize that involving professional bodies in curriculum development enhances TVET quality and credibility.

Similarly, the findings revealed that industry-academia collaboration through automobile technology has significant impact on economic resilience in Kwara State (z-score = 5.18 > 0; p-value = 0.00001 < 0.05).This finding corroborates the opinion ofOchola and Kavinda (2019) that TVET practices incorporate principles of environmental consciousness, social responsibility, and economic viability, equipping graduates with skills to meet contemporary workforce and industrial demands.

Ultimately, it was found that sustainability and innovation in training methods of automobile technology has significant impact on skill development and workforce productivity in Kwara State (z-score = 6.25 > 0; p-value = 0.00001 < 0.05). This finding coincides with the assertion made by Thomas, Ugoji and Idibia (2022) that graduates should be encouraged to start their own businesses, focusing on areas such as vehicle maintenance, green auto repairs, or the sale of eco-friendly automotive products.

## Conclusion

From the data analysed, it is concluded that the strategic adaptation of sustainable Technical and Vocational Education and Training (TVET) practices in automobile technology is essential for mitigating global economic challenges. As the automotive industry faces rapid technological advancements, environmental concerns, and fluctuating economic conditions, aligning TVET programmes with sustainable practices becomes increasingly critical. Through investigation of green technologies, fostering industry-academia partnerships, and promoting innovation in training methods, these programmes can equip the workforce with the necessary skills to drive economic resilience and competitiveness. This approach not only prepares professionals to meet current industry demands but also ensures that they are adaptable to future challenges, ultimately contributing to the long-term sustainability

of the automobile technology sector in both local and global contexts.

**Recommendations**

On the basis of the findings of this study, the following recommendations are made:

1. The curriculum planners for automobile technology should make it relevant to impart job skills in students. This could be done by incorporating the latest advancements in electric vehicles, hybrid systems, and renewable energy sources into the automobile technology curriculum. This will ensure that the workforce is equipped with skills relevant to the evolving demands of the automobile industry, promoting both environmental sustainability and economic resilience.
2. Educational institutions and industries in Kwara State should strengthen partnership bond. Regular collaboration will ensure that training programmes are align with industry needs, leading to a more skilled workforce. This collaboration should be extended to research and development initiatives, fostering innovation and the creation of sustainable solutions within the industry.
3. Moreover, instructors and trainers should receive ongoing professional development to stay updated on global best practices and technological advancements. Through this, they can provide high-quality, relevant training that prepares students for the challenges of the modern automobile industry, thus enhancing overall workforce productivity and economic stability.

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