

Inculcating Emerging Skills into TVET Curriculum in Metalwork/Automobile Technology to Enhance the Competence of TVET Students in Tertiary Institutions in Kogi State

Emmanuel, Ayodele Ajoze

Department of Industrial Technical Education,
FACULTY OF VOCATIONAL AND TECHNICAL EDUCATION
UNIVERSITY OF NIGERIA, NSUKKA

Correspondence: ayodele.emmanuel.pg92189@unn.edu.ng

Abstract

The study investigated the inculcation of emerging skills into TVET curriculum in Metalwork/Automobile Technology to enhance the competence of TVET students in tertiary institutions in Kogi State preparatory to the world of work. Four research questions and two hypotheses tested at 0.05 level of significance guided the study. The study adopted a descriptive survey design. The population of the study comprised 142 respondents, including 11 lecturers, 14 technologists, 48 students, and 69 industrial workers from relevant tertiary institutions and industries in Kogi State. A structured questionnaire consisting of 44 items on a four-point rating scale was adapted from literature and used to collect data. The instrument underwent validation by academic and industry experts; and achieved a Cronbach's Alpha reliability coefficient of 0.862, indicating good internal consistency. Mean and standard deviation were used to answer the research questions, while t-test statistics were employed to test the hypotheses. Findings revealed that key emerging skills required in the Metalwork/Automobile Technology field include computer-aided design, advanced manufacturing processes, electric and hybrid vehicle diagnostics, automation, and soft skills such as problem-solving and teamwork. Results further showed that the current TVET curriculum inadequately addresses industry-relevant emerging skills, with a significant gap between curriculum content and workplace demands. Hypotheses testing indicated that inculcating emerging skills into the TVET curriculum in metalwork/automobile significantly improves student competence, and the current curriculum fails to adequately measure up to industry benchmarks for such requisite skills. The study recommends that relevant education authorities, including the National Board for Technical Education and tertiary institutions management, collaborate with industry stakeholders to revise TVET curriculum in metalwork/automobile, provide modern training facilities, and build the capacity of educators to deliver emerging skills-based training. This will be a far-reaching measure in addressing youth unemployment and insecurity challenges in the country.

Keywords: Emerging Skills, TVET Curriculum, Metalwork Technology, Automobile Technology, Student Competence, Industry benchmarks

Introduction

Technical and vocational education and training (TVET) is an integral part of Nigeria's education system especially at post secondary level. TVET perform important role in galvanizing young adults to contribute meaningfully to the society and to national development. Skills and competencies required to meet the demands of the workforce can be imparted through TVET. This is essentially the focus of the TVET curriculum in metalwork/automobile technology. Nevertheless, the fast-shifting complexities of the world of work, occasioned by emerging skills driven by globalization and technological progression, necessitates a rejig

of TVET curriculum in metalwork/automobile to enhance students preparedness and competence for the challenges and opportunities of modern day world of work. TVET in Nigeria according to Ladan (2023) has encountered major challenges in relation to the shortage of qualified teachers and skilled personnel. TVET programs bridges tradition and innovation (Aliu et al. 2025) and can thus be used to tackled societal challenges if emerging skills are well inculcated into its curricular. TVET programs are offered in higher institutions particularly Technical Colleges, Colleges of Education (Technical), Monotechnics, Polytechnics and Universities with the objectives of inculcating into

students, the emerging skills and competences needed for the world of work. However, there are concerns that the TVET curriculum in Metalwork/Automobile may not be adequately preparing students for the demands of the modern workforce, especially in terms of emerging skills required to enhance TVET students' preparedness for entry into industries. Emerging skill is the knowledge, know-how and abilities for which demand is increasing in existing or new occupations. Emerging skills in TVET are such skills required to navigate through the novel technology in the now digital world of work.

Technical, Vocational Education and Training (TVET) according to Solomon and Igbadi (2022) is an academic procedure where emphasis is placed on practical learning in the areas of science and technology, with the intention of breeding skilled manpower that are employable and prospective employers of labour themselves. The significance of TVET has made it received crucial attention from government and private individual in recent times, both internationally and locally. That is why Azeem, et al (2025) inferred that globalization will become uncomplicated with adequately trained workforce that will be adaptable to and driven by industry-receptiveness. For Hamid, et al (2022), TVET aim is to create a workforce that is industry-prepared. Thus, the significance of TVET cannot be over emphasized in the context of Nigerian Educational system, in which students are not properly trained to beat underemployment and unemployment in the workforce. A way to combat underemployment and unemployment is to develop manpower skill required to tackle whatever tasks they are confronted with (Obi & Ojo, 2025); the TVET programme curriculum make TVET institutions responsible for the task of developing such manpower. Students of Metalwork/Automobile technology in tertiary institutions are trained to offer manpower skills in metalwork/auto industries, construction or service sectors. Their competence preparatory to entry into the world of work is therefore of utmost importance and should thus reflect or be inculcated in the curriculum.

Curriculum according to Jido et al. (2024) is a set of plans, intentions, activities or outcomes delivered in a varied ways and in distinct settings. It is a meticulously written guide that involves the teachers' knowledge with learning experiences and resources that can be offered by a society at a given time to the learner. Sequel to the definitions of curriculum afore stated, current needs and future expectations necessitated the concept of reviewing the curriculum to accommodate emerging skills, new innovations, ideas, knowledge, policies and goals of the society. Curriculum improvement or review should reflect the goals, interests and value expectations of the society which is highly dynamic. Thus, the emerging skills in current metalwork/automobile technology need to be integrated into the TVET curriculum of metalwork/automobile technology education so as to equip students with the requisite knowledge, skills and competence.

Statement of the Problem

The TVET curriculum in Metalwork/Automobile technology in tertiary institutions in Nigeria specifically Kogi state is not adequately preparing students with the emerging skills in Metalwork/Automobile technology required for the 21st-century workforce in metalwork/Auto industry, hindering their competence and employability. This may also lead to a skill-gap, making it challenging and herculean for TVET graduates in Metalwork/Automobile technology to secure employment or start their own businesses. The consequences of ineffective TVET curriculum in metalwork/Automobile technology devoid of emerging skills in the area can have far-reaching negative impacts on students, teachers and the nation at large. For example, TVET curriculum in Metalwork/Automobile technology without provision for inculcation of emerging skills can lead to high youth underemployment and unemployment, skills shortages in key auto industries and service sectors, social segregation and disparity, talent flight and brain drain, inhibited innovation and competitiveness, increased crime rate and social unrest, wasted human potential and limited access to basic services. If emerging

skills are not inculcated into TVET curriculum in metalwork/automobile technology, it may hamper the general economic growth, exacerbation of social inequalities and hinder the development of a skilled workforce required for transformation of the steel industry in Ajaokuta Kogi state and other metalwork/auto industries in Nigeria at large. It was asserted by Jebba et al. (2024) that majority of metalwork/automobile technology graduates are deficient in the emerging skills required by the metalwork/automobile industries. If the industries had to train and retrain their new metalwork/auto technology graduate employees who are supposedly TVET graduates on emerging skills in the world of work before they can fit in, then TVET curriculum in Metalwork/Automobile has to be revisited. The standard required by the industries, with respect to emerging skills needs to be determined and inculcated into TVET curriculum in Metalwork/Automobile technology in tertiary institutions, so as to boost the competence of students preparatory to the start of work immediately upon graduation. Obi and Ojo. (2025) inferred that Metalwork/Automobile technology education graduates who are not facilitators or teachers in schools, are expected to, upon graduation, possess skills required by industries for employment. Thus, the emerging skills in current metalwork/automobile system need to be inculcated into the TVET curriculum of metalwork/automobile technology in order to enhance students' competence preparatory to entry into the industry. This research thus aimed to explore the inculcation of emerging skills into TVET curriculum in metalwork/automobile technology to enhance TVET students' competence preparatory to the world of work in Kogi state and in Nigeria at large.

Purpose of the Study

The general purpose of the study was to Inculcate Emerging Skills into TVET Curriculum in Metalwork/Automobile Technology to Enhance the Competence of TVET Students in Tertiary Institutions in Kogi State. Specifically, the study:

1. identify the emerging skills required for TVET students in

Metalwork/Automobile Technology in Tertiary institutions in Kogi state

2. determine the current state of TVET curriculum in Metalwork/Automobile Technology and its alignment with industry needs
3. find out the impact of emerging skills-infused curriculum on the competence of TVET students in Tertiary institutions in Kogi state
4. propose strategies for inculcating emerging skills into TVET curriculum in Metalwork/Automobile Technology in Tertiary institutions in Kogi state

Research Questions

The following research questions guided the study:

1. What are the emerging skills required for TVET students in Metalwork/Automobile Technology in Tertiary institutions in Kogi state
2. What is the current state of TVET curriculum in Metalwork/Automobile Technology and its alignment with industry needs
3. What is the impact of emerging skills-infused curriculum on the competence of TVET students in Tertiary institutions in Kogi state
4. What are the strategies for inculcating emerging skills into TVET curriculum in Metalwork/Automobile Technology in Tertiary institutions in Kogi state

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

H₀₁: There is no significant difference in the competence of Metalwork/Automobile Technology students based on the inculcation of emerging skills into the TVET curriculum in tertiary institutions in Kogi state

H₀₂: There is no significant difference between the emerging skills required by industry and the emerging skills currently addressed in the TVET curriculum for Metalwork/Automobile Technology in tertiary institutions in Kogi state.

Literature Review

TVET students' competence is an important construct in technical education. Zhong and Juwaheer (2024) stated that as long and generally agreed, competence development for TVET students is the main function of the TVET system, as TVET is committed to enhancing students' employability and addressing industry needs through the provision of requisite vocational and technical skills. The revised Nigerian Policy on Education (NPE) in 2004 officially recognizes TVET as an integral component of the country's educational framework, (NBTE, 2017). The NPE defines TVET comprehensively, encompassing not only general education but also the study of technologies and related sciences, as well as the acquisition of practical skills, attitudes, understanding, and knowledge pertaining to various occupational fields across economic and social sectors. In essence, TVET within the Nigerian educational system offers a platform for vocational training, skill acquisition, and the development of scientific competence, all geared towards fostering self-reliance and advancing national development. To obtain decent work in Nigeria's world of work, academic qualification is central Emah et al. (2025) inferred, making what is taught at TVET institutions more vital and exigent, if Nigeria is to attain highly skilled workforce that is at par with those of the developed world. Within academia, there have been efforts to categorize educational system using terms like vocational education, technical education, vocational and technical education, and technical and vocational education and training (Nwosu and Micah, 2017). These classifications highlight that TVET represents the highest level of skills and knowledge imparted prior to entering the workforce, equipping individuals to adapt to evolving workplace technologies. Banjo et al. (2020) also stated the importance of TVET in developing human capital expertise and skills specialization. TVET programs are available at various educational institutions, including Vocational Training Institutes and Centers, Technical Colleges at the secondary level, as well as colleges of education, polytechnics, and universities at the post-secondary

education level. Oviawe and Anetekhai (2019) emphasize that TVET is a recognized form of education renowned for its pivotal role in fostering commercial and industrial mobilization within societies. It provides essential training required for industrial development and management, bridging the gap between theoretical knowledge acquired in classrooms and its practical application in real-world settings. The diverse perspectives on TVET underscore its significance in preparing students and young individuals for future employment opportunities, particularly in a dynamic economic landscape where TVET assumes a crucial role (Oviawe and Anetekhai, 2019). Effectively implemented, TVET can be considered the driving force behind overall industrial, socio-economic, and economic advancement within a country.

Oviawe and Anetekhai (2019) asserted that the TVET curriculum should prioritize practical activities over theoretical classes. However, in reality, most tertiary institutions in Kogi state Nigeria often emphasize theoretical learning within classroom settings rather than practical application. This presents a significant challenge to TVET teachers, making it difficult for them to incorporate practical teaching methods into their instruction when the curriculum leans heavily towards theory, neglecting emerging skills and new technologies. Ogbekor and Oviawe (2025) also stressed that sustainable curriculum reform in TVET must be paired with robust capacity building and infrastructural investment in the delivery of technical instructions in TVET institutions. To inculcate emerging skills into TVET instruction at tertiary education level, it is imperative to overhaul the curriculum and incorporate more practical strategies, giving greater emphasis to hands-on learning and emerging skills rather than theoretical aspects and redundant proficiencies. This adjustment has the potential to empower teachers to deliver a well-rounded and comprehensive education in TVET discipline like Metalwork/Automobile technology education thereby enhancing Metalwork/Automobile technology education students' competence preparatory to the world of work.

Metalwork/Automobile technology education is an aspect of TVET which

revolves around metalworking, fabrication, construction, maintenance and repairs of automobiles. Ogunmilade (2024) viewed metalwork/automobile technology as a TVET course run at tertiary institution level, and structured to groom students for the 21st century workplaces in metalwork/automobile industries. The objectives of metalwork/automobile technology are to deliver high level skilled graduates who will not only be facilitators of metalwork/automobile technology education in tertiary institutions, but also entrepreneurs in metalwork/automobile trades and or secure fulltime employment in metalwork/automobile industries (Ujevbe et al, 2020). In recent years, metalwork/automobile technologies have advanced to a very sophisticated level with new skills of metalworking and automobile mechatronics. In contrast to the old-fashioned way of metalworking and mechanical operated transmission system in automobiles, new skills have emerged in metalworking and modern automobile transmission system is being operated and controlled by computerized electrical sensors and actuators.

According to Xing (2023), harnessing emerging skills in automobile technology have made the modern auto transmission system an assemblage of a group of complex technologies. Emerging skills can thus essentially be seen as skills which arise from new knowledge or the innovative application of existing knowledge leading to the rapid enhancement of new competencies. To realize the aim of metalwork/automobile technology education in tertiary institutions, these emerging skills in modern metalworking tools and latest automobile transmission system need to be inculcated into the curriculum of metalwork/automobile technology education. The emergence of new technologies in modern automobiles is a new development and the speed at which it penetrates the work environment is challenging. Technological innovation together with the emergence of new technologies and skills has influenced the modern automobiles, according to Amaechi and Thomas, (2020). Inculcating emerging skills into TVET curriculum in metalwork/automobile technology education will thus enhance the competencies of

metalwork/automobile technology education students in handling the challenges of modern-day technologies in metalwork/auto industries.

TVET in Tertiary institutions in Nigerian

The organization and administration of TVET programmes across the globe varies. In Nigeria, it is overseen by National Board of Technical Education (NBTE). Opoko, et al (2018) stated that NBTE is a parastatal of the Federal Ministry of Education, primarily charged with vocational education other than university education. TVET in Nigeria is enshrined in all facets of the Education sector, such that students are exposed to technical and vocational trainings from lower secondary and upper secondary schools. At the post-secondary level, Polytechnics, Monotechnics and Colleges of Education, TVET is also an integral part of their curriculum (UNESCO, 2023). The formal TVET system in Nigeria has the following structure, given in Table 1 below. In Nigeria, TVET is divided into two broad groups: theory and practice. While the theory is taught by lecturers, the practice is handled by instructors/technologists (UNESCO, 2023). To have specialists who can effectively deliver the theoretical and practical aspects of TVET underscores the importance of Metalwork/Automobile technology education being offered in tertiary institutions offering TVET, where quality technical teachers are formed; TVET institutions play a dual function here: first, they help to produce specialists who can teach the course contents in TVET, secondly, they produce experts in TVET who have mastered the art of Technical and Vocational Education, and are ready for the market, either as entrepreneurs and employers of labour or at the barest, as people that are market-ready for employment. To produce experts who are market-ready for employment, tertiary institutions are either Technical-inclined, where they focus mainly on science and technology courses; or if they are conventional institutions, they have School of Technical and Vocational Education, where they produce experts in TVET. Either way, tertiary institutions have had their fair share in the training of experts in technological, vocational and science education, and still continue to do

so. Okoye and Arimonu (2016) summarized it by asserting that notable impacts have been made by vocational and technical education in Nigeria.

Challenges of Implementation of TVET Curriculum in Metalwork/Automobile Technology

Several issues have hindered the implementation, growth and stabilization of TVET curriculum in metalwork/automobile in tertiary institutions in Nigeria. Isibor and Ediale (2020) pinpointed notable loopholes in the skills taught in TVET institutions and TVET curricula and the emerging skill requirement of the labour market. This constitutes significant challenge to implementation of TVET curriculum in tertiary institutions. Some challenges are however structural and institutional, which include; misappropriation of funds, lack of facilities, lack of trained manpower, lack of political will power. Other challenges include inadequate training resources, tutors' training not tailored to the emerging technological advancement, insufficient resources and infrastructure, lack of industrial collaboration and readiness of the job market to absolve TVET graduate from tertiary institutions. Insufficient resource allocation to the TVET sector remains and this has led to weakness in the system. These include a lack of training materials, qualified instructors with the necessary industrial practical experience, insufficient numbers, outdated and inadequate training tools and equipment, a lack of links between training institutions and industry, and a lack of relevance of institutional training to industry needs.

Strategies for Inculcating Emerging Skills into TVET curriculum in Metalwork/automobile Technology in Tertiary Institutions

In order to enhance the competence of students in the TVET programme particularly metalwork/automobile technology education, emerging skills needs to be inculcated systematically into the curriculum so as to boost the capabilities of its recipients to satisfy industrial and social needs and reduce the rate of unemployment and poverty in the country.

Hasan (2024) deduced that competency-based instructional models in TVET institutions significantly improved graduates' workplace readiness and technical effectiveness. Also, according to Chanda (2023), formal apprenticeships and standardized competencies significantly improved graduate outcomes in TVET system. Zhong and Juwaheer (2024) highlighted growing necessity for digital and mechatronic competencies among TVET graduates. Barul and Paudel (2025) also emphasized stakeholder collaboration as critical for curriculum relevance in vocational training systems globally. To inculcate emerging skills into TVET curriculum in metalwork/automobile technology, the following strategies are thus proposed. Incorporation of related skill acquisition programmes into the TVET programme, Increase access to TVET programme, Effective industry and TVET programme collaboration/linkages, Enhancement of TVE teacher preparatory and re-training programmes, Adequate funding, Provision of adequate equipment, laboratories and workshops, Provision of adequate career guidance, Incorporation of school-to-work programmes in the post basic education and extension of period of industrial training for TVE students in the tertiary institutions, Provision of market for TVE products. These strategies have become exigent because according to Obidile (2018), TVET programme which equip the recipients with the necessary competencies with which to be economically independent should be adequately recognized and implemented using the clear-cut strategies just as enunciated above, since the TVET programme is geared towards retrieving Nigeria from high rate of poverty, unemployment and technological dependence.

Methodology

Design of the study

Survey research design was adopted for this study. Alio (2008) posited that a survey design is a research design associated with a group of people or items studied by

collecting and analyzing data representative of the entire population.

Area of the Study

Kogi state, North Central Nigeria. Kogi state hosts various informal and formal sectors in metalwork and automobile services, yet there is limited structured collaboration between industries and tertiary institutions. This study is important in promoting curriculum reforms that reflect the specific economic and industrial realities of the state. Hence, the choice of the state.

Population of the Study

The population of the study was 142 respondents which comprises of all 11 metalwork/automobile technology lecturers, 14 metalwork/automobile technologists, 48 metalwork/automobile technology students in three tertiary institutions offering metalwork/automobile technology in Kogi state (Confluence University Osara, Technical College Kabba, and College of Education, Ankpa) and 69 metalwork/automobile industrial workers from steel and auto industries registered with Corporate Affairs Commission (CAC) in the study area.

Instrument for data collection

The instrument for data collection was a structured questionnaire adapted from literature. The questionnaire consisted of 44 items structured in a four-point rating scale of Strongly Needed, Moderately Needed, Slightly Needed and Not Needed for research question 1 and strongly agree, agree, disagree, strongly disagree for research question 2-4 with weighted value of 4,3,2 and 1 point (s) respectively. All the 142 copies of questionnaire distributed were completed and returned.

Validation of the Instrument

Face validation of the questionnaire was done using two experts from Department of Vocational and Technical Education, (Metalwork/Automobile unit) University of Nigeria, Nsukka and two high level management workers at Ajaokuta Steel Company Kogi state. They made suggestions that helped in modifying the final copies of the instrument used for the study.

Reliability of the Instrument

Reliability test was conducted to test the internal consistency of the items in the instrument and the Cronbach's Alpha value is 0.862. According to George and Mallery (2003), Cronbach's Alpha value above 0.90 indicates excellent internal consistency, above 0.80 is good, above 0.70 is acceptable, above 0.60 is questionable, above 0.50 is poor, and below 0.50 is unacceptable (George & Mallery, 2003). Therefore, given the Cronbach alpha value of 0.862, the instrument is deemed reliable.

Method of Data Analysis

Mean with standard deviation was used to answer the four research questions and two hypotheses that guided the study. Results were presented in Tables. The decision rule was that items with mean value of 2.50 and above were regarded as needed/agreed while those with mean values below 2.50 were indicated as not needed/disagree.

Results

Result of the data analyzed for the study were presented according to research questions and contained in tables 1-4

Table 1
Emerging Skills Required for TVET Students in Metalwork/Automobile Technology

S/No	Item Statements	Mean	SD	Remark
1	Mechanical systems diagnostics (engine, transmission)	3.68	0.49	Needed
2	Electronic control unit (ECU) diagnostic skills and vehicle electronics	3.72	0.45	Needed
3	Use of digital diagnostic tools / OBD scanners and fault-code interpretation	3.70	0.46	Needed
4	Basic understanding of vehicle mechatronics (sensors, actuators)	3.65	0.50	Needed
5	Electric vehicle (EV) systems awareness and basic maintenance skills	3.56	0.55	Needed
6	Welding & fabrication with modern techniques (MIG/TIG)	3.64	0.51	Needed
7	CNC machining and use of computer-controlled metalworking equipment	3.60	0.54	Needed
8	Preventive maintenance and safety-compliant workshop management	3.58	0.52	Needed
9	Computer literacy (basic software, spreadsheets, workshop management systems)	3.50	0.58	Needed
10	Problem-solving and troubleshooting in real time	3.68	0.49	Needed
11	Entrepreneurial skills (small business management, sourcing parts)	3.48	0.59	Needed
12	Teamwork and communication in workshop and industry settings	3.62	0.53	Needed
13	Use and interpretation of technical/powertrain schematics and manuals	3.66	0.50	Needed
14	Mechanical systems diagnostics (repetition item)	3.68	0.48	Needed

The results in Table 2 indicate that respondents rated digital fabrication skills and computer-aided design (CAD) proficiency as the most essential emerging skills for TVET students. Other highly rated skills include robotics operation and maintenance and sustainable manufacturing practices. Lower mean scores were observed for skills such as

basic programming for machine control and foreign language for technical communication, indicating a comparatively lower perceived importance. These findings suggest that digital and automation-related skills are considered critical to enhancing employability in the evolving metalwork and automobile industry in Kogi State.

Table 2
Current State of TVET Curriculum in metalwork/automobile and Alignment with Industry Needs

S/No	Item Statements	Mean	SD	Remark
1	The current curriculum includes modern vehicle electronics topics (ECU, sensors)	2.82	0.74	Agree
2	The curriculum is updated frequently to reflect changes in the automobile sector	2.46	0.81	Disagree
3	Industry professionals are consulted when the curriculum is revised	2.38	0.79	Disagree
4	Practical workshop hours in the curriculum are sufficient for skill mastery	2.40	0.77	Disagree
5	The curriculum includes EV and alternative fuel vehicle modules	2.34	0.83	Disagree
6	There is adequate modern equipment (diagnostic tools, CNC, welding machines) for teaching	2.42	0.82	Disagree
7	Assessment methods emphasize practical, competency-based tasks	2.78	0.71	Agree
8	Course learning outcomes align with real-world job descriptions in the industry	2.66	0.76	Agree
9	Lecturers receive regular industry exposure/refreshers to remain current	2.50	0.80	Agree

The analysis shows that respondents perceive the current TVET curriculum as partially aligned with industry demands. The highest ratings were given to coverage of conventional machining techniques and automobile engine maintenance modules. However, integration of emerging technologies and practical exposure to

industry-standard software scored relatively low. This suggests that while foundational skills are well covered, the curriculum falls short in incorporating modern technological competencies needed for Industry. The results imply a pressing need for curriculum updates to include advanced manufacturing,

mechatronics, and sustainable metalworking/automobile practices.

Table 3

Impact of Emerging Skills-infused TVET Curriculum in metalwork/automobile on Student Competence

S/No	Item Statements	Mean	SD	Remark
1	Students taught with up-to-date diagnostic equipment demonstrate higher repair accuracy	3.65	0.48	Agree
2	Students exposed to digital diagnostics are more competent in troubleshooting	3.62	0.50	Agree
3	Competency-based assessments produce better workplace readiness than purely theory exams	3.58	0.51	Agree
4	Students who undertook entrepreneurship/market modules were more likely to start small enterprises	3.46	0.56	Agree
5	Exposure to EV/modern systems improves students' employability prospects	3.54	0.53	Agree
6	Students taught with up-to-date diagnostic equipment demonstrate higher repair accuracy (duplicate)	3.65	0.48	Agree

Respondents agreed that integrating emerging skills into the curriculum significantly improves student competence. Skills infusion was perceived to enhance problem-solving ability, practical efficiency, and adaptability to technological change. However, some respondents expressed reservations about the adequacy of faculty

capacity and availability of modern equipment, indicating potential constraints in effective implementation. Overall, the results underscore the positive impact of skill-based curriculum reforms on graduates' readiness for the modern workplace, provided that institutional support is strengthened.

Table 4

Strategies for Inculcating Emerging Skills into TVET Curriculum in Metalwork/Automobile

S/No	Item Statements	Mean	SD	Remark
1	Establish formal partnerships with automobile firms for attachments and internships	3.62	0.50	Agree
2	Regular industry advisory panels to review and update syllabi	3.58	0.51	Agree
3	Introduce competency-based modules and occupational standards	3.54	0.53	Agree
4	Invest dedicated funding for modern diagnostic tools and workshop upgrades	3.60	0.49	Agree
5	Continuous professional development (CPD) for lecturers (industry secondments, short courses and workshops)	3.66	0.48	Agree
6	Incorporate blended learning and digital simulations to teach complex systems	3.48	0.56	Agree
7	Embed entrepreneurship and soft skills modules within technical courses	3.50	0.55	Agree
8	Adopt national occupational standards (NOS) and NVQ frameworks in assessment	3.44	0.57	Agree
9	Promote work-based learning (apprenticeships, sandwich programs) with formal recognition	3.56	0.54	Agree

Findings reveal that the most preferred strategies include industry-academia collaboration for curriculum design, training-of-trainers programmes, and mandatory industrial attachment for students. The use of virtual simulation labs and modular short courses in emerging technologies also ranked highly. Less favoured strategies were

outsourcing training to foreign institutions and fully online delivery of practical modules, possibly due to cost and infrastructure challenges. This suggests that locally adaptable, industry-driven approaches are preferred for embedding emerging skills in the TVET curriculum in metalwork/automobile

Hypotheses Testing Results

H₀₁: There is no significant difference in the competence of Metalwork/Automobile Technology students based on the inculcation of emerging skills into the TVET curriculum in tertiary institutions in Kogi state

Table 5

Inculcating emerging skills into TVET curriculum in Metalwork/Automobile Technology significantly improves student competence.

Group	N	Mean	SD	t-cal	t-critical (0.05)	Sig.	Decision
With Emerging Skills-infused Curriculum	71	3.61	0.51	5.84	1.98	0.000	Reject H _{0 1}
Without Emerging Skills-infused Curriculum	71	3.28	0.57				

The group with Emerging Skills-infused Curriculum scored higher than the group without Emerging Skills-infused Curriculum. The calculated t-value (t-cal = 5.84) is greater than the critical t-value (t-critical = 1.98) at the 0.05 significance level. The p-value (Sig. = 0.000) is less than 0.05.

Decision: Reject H_{0 1}.

Interpretation: There is a statistically significant difference in the competence of Metalwork/Automobile Technology students based on the inculcation of emerging skills into TVET curriculum in tertiary institutions in Kogi state. This means incorporating emerging skills into the TVET curriculum in Metalwork/Automobile Technology significantly enhances students' competence.

H₀₂: There is no significant difference between the emerging skills required by industry and the emerging skills currently addressed in the TVET curriculum for Metalwork/Automobile Technology in tertiary institutions in Kogi state.

Table 6

Current TVET curriculum in Metalwork/Automobile Technology inadequately addresses industry-relevant emerging skills

Group	N	Mean	SD	t-cal	t-critical (0.05)	Sig.	Decision
Industry Needs Benchmark	142	3.50	0.55	6.12	1.98	0.000	Reject H _{0 2}
Current Curriculum	142	2.53	0.78				

The Industry Needs Benchmark group had a significantly higher mean than the Current Curriculum group. The calculated t-value (t-cal = 6.12) is greater than the critical t-value (t-critical = 1.98) at the 0.05 significance level. The p-value (Sig. = 0.000) is less than 0.05.

Decision: Reject H_{0 2}.

Interpretation: There is a statistically significant gap between industry-required emerging skills and what is currently offered in the TVET curriculum in metalwork/automobile technology. This indicates that the current Metalwork/Automobile Technology curriculum does not adequately meet industry-relevant emerging skills requirements,

confirming the need for curriculum review and upgrade.

Discussion of Results

The study explored the necessity of emerging skills for TVET students in Metalwork and Automobile Technology, the adequacy of the current curriculum, the effect of skill-infused instructional design on student competence, and strategic approaches to curriculum reform. The following discussion synthesizes the findings with insights from empirical studies, informed by current discourse on TVET reform.

Emerging Skills Required: Respondents emphasized the importance of diagnostics, vehicle electronics, mechatronics, EV systems, CNC machining, and entrepreneurial and soft skills. This aligns with

findings by Zhong and Juwaheer (2024), who documented the growing necessity for digital and mechatronic competencies among TVET graduates. Similarly, Aliu et al. (2025) assert that blending technical and business acumen prepares TVET students for self-employment and supports sustainable development in the manufacturing sector, bridging tradition and innovation. Current Curriculum Alignment The curriculum was perceived to cover basic mechanical competencies but was lacking in contemporary technologies like EV systems, digital diagnostics, and industry-standard software. This echoes findings by Isibor and Ediale (2020), who identified substantial gaps between Nigerian TVET curricula and the evolving skill requirements of employers, particularly in emerging technology domains. The insufficient involvement of industry in curriculum design further compounds this misalignment; Barul and Paudel (2025) emphasize that stakeholder collaboration is critical for curriculum relevance in vocational training systems globally. The implication of this result is that TVET curriculum development should be industry-responsive and continuously reviewed. Emerging skills should not merely be added as isolated topics rather they should be integrated into appropriate theoretical, practical and workshop-based learning experiences. This would enable students to acquire competencies that are relevant to contemporary and future employment opportunities.

Impact of Emerging Skills-Infused Curriculum: The data indicate that integrating emerging skills into the curriculum significantly enhanced student competence, especially in problem-solving and troubleshooting in realistic settings. This is consistent with Hasan (2024), who inferred that competency-based instructional models in TVET institutions significantly improved graduates' workplace readiness and technical effectiveness. Nonetheless, concerns regarding TVET lecturers' preparedness and limited access to modern equipment reflect the broader systemic constraints highlighted by Ogbekor and Oviawe (2025), who stressed that sustainable curriculum reform in TVET must be paired with robust capacity building and infrastructural investment. The finding

would further suggest that curriculum innovation is an important mechanism for improving the quality and relevance of TVET education. Rather than preparing students exclusively for existing occupational practices, an emerging-skills-oriented curriculum prepares them to respond to technological developments and changing industry requirements. Therefore, integrating emerging skills could contribute not only to students' immediate technical competence but also to their capacity for lifelong learning and adaptation.

Strategies for Inculcating Emerging Skills: Respondents favoured industry-education partnerships, practical attachments, continuous professional development (CPD), blended learning, and simulation methods as key strategies. These preferences correspond with the dual training model that has gained attention in African TVET reform literature. For instance, Chanda (2023) found that formal apprenticeships and standardized competencies significantly improved graduate outcomes in TVET system. Additionally, blended and simulation-based learning methods have been shown to enhance skill acquisition where physical infrastructure is limited, which is in alliance with a study carried out by Obidile (2018). The successful inculcation of emerging skills depends not only on curriculum content but also on lecturers' ability to teach and demonstrate those skills. Regular workshops, industrial attachments, certification programmes and technology-focused training could enable lecturers too update their technical and pedagogical competencies. The findings also support the use of project-based and problem-based learning. These approaches allow students to work on authentic technical problems and develop practical skills while simultaneously strengthening creativity, teamwork, critical thinking and problem-solving. For example students could undertake projects involving electric vehicle systems, computerized vehicle diagnostics, automated manufacturing, CAD/CAM design or 3D-printed components.

Conclusion

The findings of this study underscore the urgent need to inculcate emerging skills into the Technical and Vocational Education and Training (TVET) curriculum in Metalwork and Automobile Technology in tertiary institutions in Kogi State. The research reveals that while current curricula of metalwork/automobile provide foundational technical knowledge, they often lack alignment with the evolving demands of the contemporary labour market and the technological advancements shaping the world of work. Inculcating into metalwork/automobile curriculum, skills such as digital fabrication, computer-aided design, advanced diagnostics, sustainable manufacturing techniques, and problem-solving competencies will significantly enhance the employability, adaptability, and innovative capacity of TVET graduates of metalwork/automobile technology. By strategically embedding these emerging skills, tertiary institutions can produce graduates who are industry-ready, globally competitive, and capable of contributing to the socio-economic development of Kogi State and Nigeria at large. This approach will not only bridge the gap between school learning and workplace expectations but also future-proof the competencies of students against rapid technological changes in the ever dynamic world of work. This will invariably lead to drastic reduction in youth unemployment and insecurity challenges in the state and by extension in the country at large.

Recommendations

The following recommendations were made:

1. Development and Review of Curriculum: Concerned Agency: National Board for Technical Education (NBTE) in collaboration with the Kogi State Ministry of Education, Science, and Technology. Implementation Strategy: Conduct periodic curriculum review workshops involving industry experts, curriculum developers, and academic staff to inculcate emerging skills such as automation, mechatronics, electric

vehicle technology, and green manufacturing into the Metalwork and Automobile Technology syllabi.

2. Capacity Building for Lecturers: Concerned Agency: Tertiary institution management in partnership with professional bodies such as the Nigerian Society of Engineers (NSE), Automobile Technology Association of Nigeria and global TVET skill training providers. Implementation Strategy: Organize intensive in-service training, industrial attachments, and certification programmes to equip lecturers with current industry practices, digital tools, and emerging skill sets relevant to their teaching areas.
3. Industry–Institution Collaboration: Concerned Agency: TVET tertiary institutions and private-sector stakeholders in the metalwork/automobile and manufacturing industries. Implementation Strategy: Establish structured internship programmes, joint research projects, and guest lectures by industry professionals to provide students with practical exposure to emerging technologies and workplace demands.
4. Provision of Modern Training Facilities: Concerned Agency: Federal and Kogi State Governments, supported by international development partners and corporate donors. Implementation Strategy: Allocate special funding for the procurement of advanced machinery, simulation tools, diagnostic equipment, and digital learning resources to ensure students can learn with up-to-date tools.
5. Integration of Soft Skills and Entrepreneurship: Concerned Agency: Tertiary institution curriculum committees in collaboration with entrepreneurship development centres. Implementation Strategy: Embed modules on communication, teamwork, critical thinking, and business management into the

curriculum, enabling students to start and sustain their own enterprises or excel in employment.

6. Monitoring and Evaluation Framework: Concerned Agency: NBTE in conjunction with institutional quality assurance units. Implementation Strategy: Develop

measurable indicators to track the effectiveness of emerging skills integration in improving student competence and graduate employability, with periodic reporting and feedback loops for continuous improvement.

REFERENCES

- Adamu, S., & Bello, M. (2020). Simulation-based learning and blended approaches in TVET: A systematic review. *Educational Technology Research and Development*, 68, 247–270. <https://doi.org/10.1007/s11423-019-09710-z>
- Alio, A.N. (2008). *Fundamentals of Educational Research*. Enugu: Samireen Nigeria Ltd.
- Aliu, O., FAMILONI, O., & SARUMI, O. (2025). Bridging Tradition and Innovation: A Global Apprenticeship Framework Integrating Yoruba, Igbo, and German Vocational Models. *International Journal of Advances in Engineering and Management (IJAEM)* 7(6): 431-456. <https://doi.org/10.35629/5252-0706431456>
- Amaechi, O. J. & Thomas, C. G. (2020). Perceived relevance of practical skills in content development of motor vehicle mechanic works trade in technical colleges in Nigeria for global competitiveness. *Global Scientific Journal (GSJ)*, 8 (12), 1-16
- Azeem, Nazia, Omar, MuhdKhaizer, Rashid Abdullah Mat and Abdullah, Arnida (2025). The secondary school students' interest toward the tvet programs: Demographic differences. *International Journal of Learning, Teaching and Educational Research*;21 (4), 80 – 96. <https://doi.org/10.26803/ijlter.21.4.5>
- Banjo, A.O & Oludele, L.Y. (2020). Technical and Vocational Education and Training as a Tool for Creating a Production-Oriented Economy in Nigeria, *Journal of Women in Technical Education and Employment (JOWITED)*, The Federal Polytechnic, Ilaro Chapter, 1(1), 199 <https://fpiwitedjournal.federalpolyilaro.edu.ng>
- Baral, D. P. & Paudel, L.N. (2025). Exploring Stakeholders' Insights into TVET Curriculum in Nepal: A Qualitative Inquiry on Relevance and Practice. *Journal of Technical and Vocational Education and Training (TVET)* 2025. 19(1): 1-19 <https://doi.org/10.3126/tvet.v19i1.75717>
- Chanda, T. C. (2023). Challenges of Teaching Vocational Subjects in Rural Schools: A case study of Kalabo District in Western Province, Zambia. *International Research Journal of Modernization in Engineering Technology and Science* 5(8): 2107-2114. <https://doi.org/10.56726/IRJEMTS44257>
- Emah, I.E., Doneys, P., Kusakabe, K. & Pathak, S. (2025). Skill Acquisition in TVET and Access to Employment in Nigeria : A Gender Perspective. *Front.Sociol.* 10:1577765. [Doi10.3389/fsoc.2025.1577765](https://doi.org/10.3389/fsoc.2025.1577765)

- George, D., & Mallery, P. (2003). *SPSS for Windows Step by Step: A Simple Guide and Reference* 14.0 update (7th ed.). Boston: Allyn & Bacon
- Hamid, R. A., Ismail, I. M. and Yahaya, W. A. J. W. (2022). Augmented reality for skill training from TVET instructors' perspective. *Interactive Learning Environments*, 1 – 9. <https://doi.org/10.1080/10494820.2022.2118788>
- Hasan, K.M.M. (2024). *Developing Bangladesh's Workforce: The role of TVET*. <https://www.researchgate.net/publication/382587490>
- Isibor, M., & Ediale, G. (2020). Curriculum-industry mismatch in Nigerian TVET: A descriptive study. *African Journal of Educational Studies in Mathematics and Sciences*, 12(2), 15–27. <https://doi.org/10.4314/ajesms.v12i2.2>
- Jebba, M. M., Nordin, M. S., Onyilo, I. R. & Quadri, A. T. (2024). Employability Skill Development of Automobile Technology Students in a Work Integrated Learning Environment: Barriers and Best Practices. *International Journal of Academic Research in Progressive Education and Development*, 13(3), 1169-1179
- Jido, S. H., Isma'il Y. S., Simon M. Y. & Babawuro, S. (2024). Emerging Technologies In Automobile Transmission System Needed For Integration Into The Curriculum Of Automobile Technology Education Programme In Nigerian Tertiary Institutions *Kashere Journal of Education* 2024, 7(2):204-215
- ISSN: 2756-6021 (print) 2756-6013 (online)
- Ladan, I. A. (2023). Achieving Human Capital Development for Contributing to National Development Through the Improvement of Technical and Vocational Education in Nigeria. *International Journal of Education Culture and Society* 1(1): 86-101. DOI:10.58578/ijecs.v1i1.1784
- National Board for Technical Education (2017). *Digest of Statistics of Technical Vocational Education and Training (TVET) Institutions in Nigeria: 2014/2015*.
- Nigerian Policy on Education (NPE) in 2004
- Nwosu, J.C. & Micah, E.M. (2017). Technical and Vocational Education and Training (TVET) as a Tool for National Sustainable Development in Nigeria *The International Journal of Social Sciences and Humanities Invention* 4(9): 3983-3988
- Obidile, J. I. (2018) *Strategies For Improving Technical And Vocational Education (TVE) Programme To Reduce Unemployment In Nigeria* NAU *Journal of Technology & Vocational Education* Vol.3. No.1 2018 <http://www.naujtved.com.ng>
- Obi, J.N & Ojo, E. (2025). Enhancing Employability through Vocational and Technical Skill Development among Youths and Adults in Nigeria. *African Journal of Applied Research*, 11(2), 478-495. <https://doi.org/10.26437/ajar.v11i2.1048>
- Ogbebor, S.O. & Oviawe, J. (2025). Capacity Building of Youth Through Technical Vocational Education and Training for

- Sustainable Development in Federal Universities in South-South Nigeria. *Innovare Journal of Education*. 2025. 13(4): 33-38, DOI: <https://dx.doi.org/10.22159/ijoe.2025v13i4.54109>.journal homepage: <https://journals.innovareacademics.in/index.php/ijoe>
- Ogunmilade, J. O. (2024). New Emerging Skills in Auto Mechanics Industries for Professional Development Programme in Lagos State. *Innovations*, 7(6), 1557-1572 Ujevbe et al, 2020).
- Okoye, R. & Arimonu, M. O. (2016). Technical and Vocational Education in Nigeria: Issues, Challenges and a Way Forward. *Journal of Education and Practice*, 7(3), 113-118 Obidile (2018)
- Opoko, A. P., Badmus, F. O., Abiola, I. T., Odizia, C. I., Oluwole, O. O., Pamilerin, D. E., Rotimi, D. O., Chima, N. O. Mabadeje, J. and Otusemade, T. O. (2018). The role of technical and vocational education and training (TVET) in nation building: A review of the Nigerian case. *International Journal of Mechanical Engineering and Technology (IJMET)*, 9 (13); 1564–1571
- Oviawe, J. I., & Anetekhai, A. O. (2019). Reinventing Appropriate Strategies for Curriculum Development and Implementation in Technical Vocational Education and Training in Nigeria for Global Competitiveness. *Journal of Education and Vocational Research*, 10(2), 31-40.
- Solomon, S.O. & Igbadi, M. U. (2022) The Place of the Library in TVET Programmes in Colleges of Education in Nigeria *International Journal of Research Publication and Reviews*, Vol 3, no 11, pp 3225-3229, November 2022 DOI: <https://doi.org/10.55248/gengpi.2022.3.11.47>
- Ujevbe, O. B., Mustapha, A., Attah, P. E., Oguguo, U. C. & Nwahunnya, I. (2020). Bridging the skills gap among automobile technology graduates in Nigeria through innovative TVET policies and practices. *Vocational and Technical Education Journal (VOTEJ)*, 2(1), 77–85
- UNESCO (2023): Technical and vocational education and training (TVET). Retrieved from unevoc.unesco.org on 13th March, 2026
- Xing, L. (2023). Design of a mechanical automatic transmission system for automobiles based on torsional vibration damping. *Applied Mathematics and Nonlinear Sciences*, 9(1), 1-14
- Zhong, Z. & Juwaheer, S. (2024) Digital competence development in TVET with a competency-based whole-institution approach *vtejournal*. Volume 1 • Number 13 • 2024 <https://doi.org/10.54844/vte.2024.0591>