ISSN: 2992-2313 (Online)
ISSN: 2992-2305 (Print)

AUTOMOTIVE MAINTENANCE SKILL NEEDS OF AUTO-MECHANIC STUDENTS IN TECHNICAL COLLEGES FOR SUCCESSFUL ENTERPRISE IN THE ERA OF ECONOMIC UNCERTAINTIES

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Abstract

The imperative to ascertain automotive maintenance skill needs of automechanic students in technical colleges in Anambra State, to successfully engage in automobile enterprise necessitated the study. A descriptive survey design, guided by four research questions was adopted for the study. The population comprised 56 automechanic teachers in technical colleges in the State. A five-point rating scale questionnaire containing 22 items validated by three experts was used for data collection. The reliability coefficient of the instrument was established using Cronbach Apha, which yielded 0.85, 0.83, 0.84, 087 and 0.82 respectively. The researchers, with the help of two research assistants administered the instrument directly to the respondents and retrieved same within two weeks. Mean was used to answer the research questions. Consequent upon thorough analysis of the data, the findings revealed, among others that, continuous education and intensive training is needed to keep the students abreast with requisite but current skills to meet the evolving demands of modern vehicle maintenance. It was therefore concluded that consistently engaging the students in problem-solving-based learning/training could enable them imbibe the principles and skill sets to confidently repair modern automobiles. Based on the foregoing findings, the following among others were recommended: government should ramp up investment in education and training of automotive technicians so as to make them fit for employment after graduation. Government should equip technical colleges with the state-of-the art equipment and functional or live vehicles for pragmatic and robust engagements that would foster proficiency, competency and quality assurance in their service delivery in especially in this era of economic uncertainties.

Keywords: *Automotive maintenance skill needs, Automechanic students, Successful enterprise, Era, Economic uncertainties*

Introduction

The automobile industry in Anambra state, Nigeria, has experienced significant growth in recent years, leading to an increased demand for skilled auto-mechanics. However, as vehicles become more advanced and complex (Adereti, 2019), it is crucial for auto-mechanics to possess specific automobile maintenance skills that are currently in demand. Possession of these skills would enable them to effectively diagnose and repair various automotive issues, ensuring the smooth functioning and safety of vehicles (Okoye & Okoye, 2016).

The determination of automobile maintenance skills needs of auto-mechanics students in technical colleges is crucial to ensure that they possess the requisite skills and knowledge to provide effective and efficient maintenance services. This assessment will enable the development of targeted training programs to address palpable gaps and enhance the overall competence of auto-mechanics in the state, especially in this challenging socio-economic upheaval driven by technological inventions.

Hence, the need to identifying specific areas where auto-mechanics students may require further training or skill improvement and capacity building in order to function professionally in automobile industry where the ability to maintain automobiles is hinges on. Maintenance is described as an action taken on any device or a system to keep it working satisfactorily. Okwelle, Beako and Ajie (2017) opined that maintenance is a repair activity carried out on equipment, vehicles or other machineries to keep them unaltered, and if altered, to restore them to their original state. Maintenance in the context of this study is the process by which motor vehicle parts get serviced or replaced before they break down. As such, possession of substantial generic and technical skills are crucial for maintaining modern automotive or automobiles that complex and sophisticated designs and advanced technology such as network of electronic systems. Isaac (2015) opined that automotive vehicle of nowadays are equipped with significant number of networks of electronics systems, advanced vehicle control, elimination of bulky wiring with sophisticated features. Additionally, most of the features are electronically enabled by the use of distributed electronic systems including sensors, switches, actuators and Electronic Control Units (ECUs) (Wyman 2017). Little wonder, motor car of today has over fifty or more individual ECUs communicating over multiplexed data networks such as Controller Area Network (CAN), Local Interconnect Network (LIN) and Flex Ray for X-by-wire applications (Vander-Wall, 2020).

However, the paradigm shift in recent years from Off- Board dealership-based diagnosis and repair to on-Board remotely assisted diagnosis and in vehicle diagnosis scheme seems to improve customer expectations and satisfaction for vehicle reliability. Regrettably, customers' satisfactions seem not been met owing to the level of incompetence being exhibited by majority of the roadside motor vehicle mechanics and graduates of automobile technology. Incidentally, the rapid technological advances in Automobile sector have increased the quest for cutting training to produce automobile technicians, master craftsmen and craftsmen that could respond appropriately to the yearnings of the sector (Okoye & Okoye, 2016). As measures to keep education and training in tune with the knowledge and skills required in the world of work, informal training of craftsmen, school courses and curricula could be reviewed, enriched and updated regularly in line with changes that are taking place in the industries (International Labour Organization, 2020). This makes it imperative to investigate the requisite skills needs of motor vehicle mechanics in order to maintain and repair modern automobiles satisfactorily.

Understanding and underscoring the specific skill needs of auto-mechanics students will allow for the identification of skill gaps in the current workforce, so as to bridge the prevail gap, by ensuring that auto-mechanics students possess essential skill to navigate the industrial landscape. It could trigger-off onward development of a standardized curriculum

ISSN: 2992-2313 (Online)
ISSN: 2992-2305 (Print)

for training auto-mechanics graduates and trainees. Apparently, there seem to be inconsistency in the modus oprandi as well as the content of the training programmes offered, leading to incompetency in skills and knowledge acquired by auto-mechanics trainees (Nwachukwu & Eze, 2020). Identification of specific skill needs could stimulate swift formulation and adoption of standardized and pragmatic curriculum that would propel learners to receive comprehensive training to bolster their expertise and professional acumen in the industry (Okoye & Okoye, 2015). This would enable them to realise the benefits and prospects of automobile technology education, and vigorously pursue them. Awareness of prospects of automobile technology education could instil in learners unwavering enthusiasm to progress in the trade.

Unfortunately, many vehicle owners have expressed dissatisfaction with the quality of repairs and maintenance provided by auto-mechanics in the area (Umeadi & Okonkwo, 2018). This failure could be attributed to lack of proper training and inadequate knowledge of modern automobile systems and emerging technologies alongside their corresponding skills (Xilong, 2023). By identifying the specific skill needs, necessary steps would be taken to improve the quality of service provided by auto-mechanics experts to guarantee customers' satisfaction and safety on the road.

Additionally, the impact of technological advancements in automobile maintenance owing to the introduction of complex systems and components in modern vehicles, auto-mechanics need to possess a diverse set of skills, including proficiency in computer diagnostics, electrical systems, engine management, and advanced troubleshooting techniques (Onwuka & Nwagwu, 2019); necessitating further training and upskilling for auto-mechanics graduates to fit in.

Appreciating specific automobile maintenance skills needs of students in technical colleges could spark off cogent discourse and engagements to foster self-reliance and professional development that could predispose them to industrial practices and high-quality service delivery to customers.

Statement of the Problem

The acquisition of automotive maintenance skills needs to match up with the prevailing reality in automobile industry is not only paramount, but indispensable if the state hopes to benefit from it. Hence, essence of introducing auto-mechanics in technical colleges in the State is to ensure seamless and continuous production of experts or professionals who would satisfactorily maintain automobiles of various designs and manufacturers according to specifications using the requisite knowledge and skills obtained therefrom. Apparently, the would-be-professionals appeared not to possess adequate skill set to function optimally, hence the need to investigate essential maintenance skills they needed to establish a firm footing in the fast-advancing technological world. Against this backdrop, the study underscored various skills required to attain the goals, such as diagnostic, electrical system repair, brake system repair, engine repair, and general maintenance skills. The realisation of this goal would facilitate onward review of the curriculum to problem-solving oriented programme as well as provides pragmatically empirical evidence for futuristic investigations that could reposition the programme in order to produce competent professionals that would sustain the industry and significantly impact national development.

Purpose of the Study: The main purpose of the study was to ascertain automobile maintenance skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties. Specifically, the study determined:

1. automobile diagnostic skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties.

2. electrical system repair and maintenance skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties.
3. brake system maintenance skill needs of auto-mechanic students in technical colleges for successful enterprise in the era of economic uncertainties.
4. general maintenance and inspection skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties.

Research Questions: The following research questions guided the study:

1. What are the automobile diagnostic skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties?
2. What are the electrical system maintenance skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties?
3. What are the brake system maintenance skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties?
4. What are the general maintenance and inspection skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties?

Methodology

A descriptive survey design was adapted for the study. The study was conducted in technical colleges in Anambra State in the south-eastern region of Nigeria. The State has several technical colleges, including State-owned and that of the federal that offer auto-mechanics technology. The population of the study comprised 56 auto-mechanics teachers in technical colleges in Anambra State. A census sampling approach, which employed as the targeted population was manageable. The instrument used for data collection was a structured questionnaire face-validated by three experts, and titled, Automotive Maintenance Skills Needs of Auto-Mechanics Students' Questionnaire (AMSNMSQ). The questionnaire has 22 items, structured in 5-points rating scale of Very Highly Needed (VHN)=5, Highly Needed (HN) =4, Moderately Needed (MN) =3, Lowly Needed (LN) =2, Not Needed (NN) =1. The reliability of the instrument was ascertained using Cronbach Alpha method which yielded the reliability coefficient of 0.89, 0.87, 0.85 and 0.83 respectively, which were considered reliable for the study. Fifty (50) copies of the instrument were administered to the respondents while 48 copies were retrieved after two weeks, making 96% return rate. Data obtained were analysed using means statistic, while the real limit of values were used for decision rule for interpretation of the mean score follows: Very Highly Needed = 4.50 – 5.00**;** Highly Needed = 3.50 – 4.49**;** Moderately Needed -2.50 – 3.49**;** Lowly Needed -1.50 – 2.49 **and** Not Needed -1.00 – 1.49.

Results

Research Question One: What are the specific automobile diagnostic skill needs of automechanic students in technical colleges for successful enterprise in the era of economic uncertainties?

ISSN: 2992-2313 (Online)
ISSN: 2992-2305 (Print)

Table 1: Mean scores of automobile diagnostic skills required of automechanic students in technical colleges for successful enterprise

S/N	Automobile Diagnostic Skill Needs of Students	X	Decisions
1.	Ability to handle OBD issues	3.36	highly needed
2.	Ability to interpret readings using diagnostic devices needed	3.43	moderately
3.	Ability to synchronize the OBD with the vehicle system so as to conduct necessary operations.	3.50	highly needed
4.	Ability to trace engine faults with the gadgets.	3.71	highly needed
5.	Ability to dictate electrical faults using OBD.	3.79	highly needed
	Cluster mean	**3.56**	**Highly Needed**

Table 1 presented the mean scores of automobile diagnostic skill needs of students in technical collages in Anambra state. The results revealed that the respondents upheld that items 1,2,3,4 and 5 items above were needed with the cluster mean of 3.56, indicating that the following skills are highly needed: ability to handle OBD issues, ability to interpret readings using diagnostic devices, ability to synchronize the OBD with the vehicle system so as to conduct necessary operations, ability to trace engine faults with the gadgets and ability to dictate electrical faults using OBD.

Research Question Two: What are the auto-electrical system maintenance skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties?

Table 2: Mean scores for auto-electrical system maintenance skill needs of students

S/N	Electrical System Maintenance Skills Needs	X	Decision
6.	Ability to trace fault using volt metre or scanning machine	3.29	moderately needed
7.	Ability to dismantle alternator and refurbish it.	3.07	moderately needed
8.	Ability to fix headlamps and lighting system.	3.36	moderately needed
9.	Ability to fix or refurbish starter motors	3.29	moderately needed
10.	Ability to trace faulty fuse and replace it	3.36	moderately needed
11.	Ability to repair and assemble alternators	3.07	moderately needed
Cluster mean		3.24	**Moderately needed**

Data presented in Table 2 show the mean score of the automobile electrical system maintenance skills needs of auto-mechanic students in technical collages for successful enterprises. The results further revealed that the respondents agreed on items 6, 7, 8,9,10 and 11 which resulted in a cluster mean of 3.24; implying that the respondents upheld that: ability to trace fault using voltmeter or scanning machine, ability to dismantle alternator and refurbish it, ability to fix headlamps and lighting system, ability to refurbish starter motor, ability to trace faulty fuse and replace it, ability to assemble alternator are moderately needed.

Research Question Three: What are the specific brake system maintenance skill needs of auto-mechanics students in technical colleges for successful enterprise in the era of economic uncertainties?

Table 3: Mean scores of automobile brake system maintenance skill needs of automechanics students for successful enterprise

S/N	Brake System Repair Skills	X	Decision
12	Ability to service the brake system ABS	3.50	highly needed
13	Ability to bleed brake systems.	3.21	moderately needed
14	Ability to replace brake disk and service the unit.	3.36	moderately needed
15	Ability to replace brake shoes and drum.	3.00	moderately needed
	Cluster mean	3.27	**Moderately needed**

Table 3 presented the mean score of the automobile brake system maintenance skill needs of auto-mechanics students in technical colleges for successful enterprises. The results revealed that the respondent agreed on the item on 12, 13, 14, and 15 with the cluster mean of 3.27; indicating that the respondents agreed on the ability to service brake system ABS, ability to bleed brake systems, ability to replace brake disk and service the unit, ability to replace brake shoes and drum.

Research Question Four: What are the specific engine maintenance skills needs of automechanics students in technical colleges for successful enterprise in the era of economic uncertainties?

Table 4: Mean scores of specific engine maintenance skill needs of automechanics students in technical colleges for successful enterprises

S/N	Engine Repair and Maintenance Skill Needs	X	Decisions
16	Ability to identify and replace faulty plugs replace.	3.79	highly needed
17	Ability to service and replace injector nozzles.	3.64	highly needed
18	Ability to service ignition system	3.43	moderately needed
19	Ability to identify faulty timing belts.	3.50	highly needed
20	Ability to replace faulty timing belts.	3.79	highly needed
22	Ability to change engine oil.	3.43	moderately needed
23	Ability to reset millage.	3.00	moderately needed
	Cluster mean	3.51	**Highly needed**

Data in Table 4 revealed that the mean scores of specific engine maintenance skill needs of auto-mechanic students in technical colleges in Anambra State. The results revealed that the respondents upheld items 16, 17, 18, 19, 20, 21, and 22 with a cluster mean of 3.51, indicating that the respondents affirmed that ability to identify faulty plugs and replace them, ability to service and replace injector nozzles, ability to service distributor system or ignition coils, ability to identify faulty timing belts, ability to replace faulty timing belts, ability to change engine oil and ability to reset millage are all needed.

Discussion of Findings

The findings based on research question one revealed that respondents upheld the significance of automotive diagnostic and repair skills concerning OBD systems and diagnostic gadgets. This is in agreement with the assertion of Wyman (2017), which maintained that such skills or competencies are not only classified as highly essential but also pivotal for efficient vehicle diagnosis and upkeep. This suffices that automobile diagnostic skills are vital for accurate identification and troubleshooting in vehicles, ensuring effective repair processes and customer satisfaction.

ISSN: 2992-2313 (Online)
ISSN: 2992-2305 (Print)

As regards the findings from research question two, the respondents upheld all the items as necessity for bolstering proficiency in electrical system maintenance skills. The findings corroborated the view of Xilong (2023) which contended that modern vehicles are becoming increasingly reliant on complex electrical systems; this makes it imperative for auto-mechanics to possess the expertise to diagnose and rectify electrical faults. Hence, all the skills highlighted above are moderately needed.

Furthermore, findings emanating from research question three in respect of various automotive brake system maintenance skills was rated moderately needed by the respondents. This is in tandem with the submission of Umeadi & Okonkwo (2018) which affirmed that such abilities are indispensable for maintaining proper braking performance. Thus, suggesting further education and training to enhance automotive technicians' aptitudes and competence in ensuring vehicle safety on the road.

Finally, the findings in respect of research question four suggested that specific engine maintenance skills are highly needed as they constitute the integral aspect of automobile system. This claim absolutely concurs with the assertion of Vander-Wall (2020), which opined that these skills are crucial for effective vehicle maintenance as well as ensuring proper vehicle performance and reliability. This calls for further education and training in these areas to enhance automotive technicians' capabilities and improve overall vehicle maintenance skills.

Conclusion

In conclusion, the study on the automobile maintenance skills needs of auto-mechanics in Anambra State has provided valuable insights into the specific skill sets essential for proficient automotive repair in the region. Through an in-depth exploration of diagnostic skills, electrical system maintenance skills, brake system maintenance skills, specific engine maintenance skills, and general maintenance and inspection skills, the study has shed light on the diverse competencies required by auto-mechanics.

The findings having underscored the import of equipping auto-mechanic students with a comprehensive skill set to meet the ever-evolving demands of the automotive industry, it noteworthy that these skills are essential not only for ensuring the efficient and effective repair of vehicles but also for enhancing safety, reliability and customer satisfaction. Sequel to the foregoing, it is therefore, concluded that the acquisition of requisite skills will not only embolden their confidence to explore their potentials but also be able to navigate the prevailing economic reality that is characterized by choking uncertainties.

Recommendations: Based on the findings of the study, the following were recommended:

1. Teacher should incorporate into their teaching, the identified skill sets, with a focus on hands-on training and practical experience. This would enable the students become acquainted with requisite maintenance skills such as, diagnostic techniques, electrical system, brake system, engine system and general inspection maintenance skills.
2. Auto-mechanics students should be allowed to engage in pragmatic and hands-on activities on every topic or concepts taught in class. This will enable them acquire requisite knowledge and competences to operate creatively in automobile industry; thereby contributing to economic and technological advancement of the nation.
3. School authorities should in collaboration with relevant stakeholders in order to provide the necessary facilities, equipment and tools for lifelong learning. This will not only bridge the yearning gap between academic learning and real-world applications, but also compel them to learn creatively and professionally.
4. Automotive industries should partner with technology and vocational institutions to avail learners/students access to their industries where they could engage creatively in

real-work situation as internship, apprenticeship, and mentorship programs etc, providing students with practical experience and exposure to industry trends and challenges.

5. Industry associations and regulatory bodies should establish quality assurance mechanisms and standards compliance frameworks to uphold professional standards and ensure the delivery of high-quality automobile maintenance services. This may involve accreditation programs, certification requirements, and periodic audits to assess compliance with industry standards and best practices.

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