TECHNICAL SKILLS REQUISITES OF AUTO-MECHANICS STUDENTS IN THE MAINTENANCE OF MODERN VEHICLES IN NIGERIA.

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Abstract

The study determined the Technical skills requisites of auto mechanics students in the maintenance of modern vehicles in Nigeria using a cross sectional survey research in which data were collected through a 30 item questionnaire on a target population of 340 consisting of 180 industrial workers and 160 technical teachers gotten from technical colleges and automobile maintenance and services units from Zuba, Federal Capital Territory Abuja; Kaduna State and Niger State. A convenient sampling technique was used to select 80 industrial workers and 80 technical teachers making up a total population of 160 respondents. The data were analyzed using mean and standard deviation on a 4-point scale, while t-test was used to test the null hypotheses at 0.05 level of significance. Findings of the study revealed among others that the technical skills posses by auto mechanics students is not satisfactorily significant for effective maintenance and repair of modern vehicles.; as a result craftsmen graduating from auto mechanics' programme finds it difficult to efficiently apply computers in carrying out automobile diagnoses and repairs. The study recommended among others: that there should be periodic review of the technical college auto mechanics' curriculum and the curriculum for training of automobile teachers to equip the teachers with the requisite technical and pedagogical skills needed to expose the students to the requisite skills. Similarly, the study suggested among others the organizing of retraining courses and workshops for auto-mechanics for enhancing their skills for effective maintenance of modern vehicles.

Keywords: *Technical skills, motor vehicle mechanics & modern vehicles*

Introduction

Changes in technology have continued to bring about changes in the work-place. New technologies are resulting in new work curricular contents, often involving new tools and equipments. Automotive vehicles are nowadays equipped with a significant number of networks of electronics systems by which advanced vehicle control, elimination of bulky wiring and sophisticated features are achieved. Most of the features are enabled by the use of distributed electronic systems including sensors, switches, actuators and Electronic Control Units (ECUs). The 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 (Isaac, 2015). However, as more features and ECUs are introduced, overall system complexity increases, in turn raising the likelihood for unpredictable or emergent behavior that could not have been anticipated two decades ago.

The On-Board Diagnostics (OBDs) systems is been used for faults detection when vehicles are used by customers. OBDs are integrated in ECUs to detect and diagnose vehicle faults such that diagnostic trouble codes (DTCs) relevant to the faults are set and logged in. Despite the available OBDs, diagnostic techniques have largely been focused on individual or defined vehicle, such as Engine Management (EM), Automatic Braking System (ABS) and steering (Igwe, Ikenwa & Jwasshaka, 2017). According to the Igwe et al., (2017), in vehicles where only a few ECUs and communication messages are employed, traditional off-board diagnostic approaches have become more costly and sometimes ineffective, resulting in inability to detect faults, incorrect

component replacement and increased warranty costs. There is a paradigm shift in recent years from Off-Board dealership-based diagnosis and repair to On-Board remotely assisted diagnosis and in-vehicle diagnosis scheme will improve customer expectations and satisfaction for vehicle reliability.

Automotive mechanics' students must be able to understand new and ever-changing automotive technologies. Vehicles have become increasingly more computer-oriented, so mechanics must understand computer technology. Mechanics also must be skilled in the use of repair tools, vehicle components and vehicle systems. Due to many skills required, mechanics are usually required to undergo specific educational programs and obtain certification. Isaac (2015) stated that there are various technical skills required by automobile mechanics to meet up with the maintenance of the ever-changing technological vehicles. A skill denotes expertise or ability developed in the course of training and experience demonstrated by an individual to expertly use manual dexterity in a particular vocation. In the automobile trade, it includes not only trade and craft skills acquired by apprenticeship, but also includes technical knowledge, manual skills and high thinking skills needed to perform effectively in the automobile workplace or learning environment. The skills of an auto-mechanic will vary greatly; some mechanics develop the skills to work on all parts of a vehicle, while others choose to specialize in a particular part of vehicle.

A competent car mechanic should also have mastery over a wide variety of integrated skills, such as the electrical system, fuel system and the air conditioning system. Computer skills are also needed in the day-to-day operations, and are as much a part of the tool box as wrenches and others. As knowledge is gained, it becomes easier to move into higher paying positions. Computers

are integrated with autos, and the skill set means being able to adapt to new technology in the handling various automobile systems. Preparation is very vital toward achieving success in maintenance and repairs of modern vehicles. This means placing oneself into some type of technical school program. As time goes on, many older instructors do not possess the computer skills necessary to teach the aspiring auto mechanics of today. With additional skills, it is easy to gain employment and if you've acquired the proper training and skill set, doors will open wide for you. According to the National Automotive Design and Development Council (NADDC) (2017), the ability to endure the profession is a key ingredient that an auto mechanic should possess. It is given that most mechanics have entertained a lifetime fascination with cars. Thus, it's rare to jump from one career field to the next once you're a mechanic. After few years, auto mechanics would have been exposed to a variety of problems, and would have gained enough experience to become specialists as a result of continual training. After about ten years out, the most experienced and ambitious automotive mechanics may open their own shops, and those working at dealerships may have risen to supervisory positions.

Given the scenario above it is obvious that that developing technical skills is imperative in the world of work. This is so because the Automobile industries of today have shifted from ordinary trial and error means of diagnosis and repairs to the On-Board- Diagnostic system. Furthermore, rapid technological changes in Automobile sector have increased the need for providing technical skills to enable automobile technicians, master craftsmen and craftsmen to cope with the emergent workplace skills. Some studies conducted by Isaac (2015) and Igwe *et al.*, (2017), revealed that the products of Advanced National Technical Certificate

(ANTC) and National Technical Certificate (NTC) lacked the basic skills required for gainful employment in today's automobile industry. Their findings revealed that the curriculum was inadequate as well as irrelevant to offer adequate skills required to meet the challenges involved in the maintenance of modern automobiles plying Nigerian roads. The incorporation of new technologies with new subsystems and system components into modern automobiles have changed their configurations and made their maintenance a more complex task (Igwe *et al.*, 2017).

The gaps created in the curriculum and the new technological innovations have brought about the need for improved skills to function and cope with the dynamism in automobiles (Olaitan, 2014). The result has been that the graduates of automobile are often unemployable or underpaid on the job, while most automobiles with the new innovations either suffer disrepair in the process of using sub standard components. Some are even completely grounded as they are brought into Nigeria because of lack of competent personnel for effective maintenance. As measures to keep education and training in tune with the knowledge and skills required in the world of work, school courses and curricula could be reviewed, enriched and updated regularly in line with changes that are taking place in the industries. Thus, it is imperative to investigate the new technological innovations in automobile with the view to identifying those that posed new challenges to automobile technicians in Nigeria with a view to integrating into them the curriculum of NTC training programme. This is with the hope that the move would help cub incompetence usually experienced amongst automobile technicians in the maintenance of modern vehicles.

Research Questions

The following research questions guided the study:

1. What are the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles?
2. What are the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles?
3. What are the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles?

Research Hypotheses

Three null hypotheses were tested at .05 levels of significance.

H_{O1}: There is no significant difference in the mean responses of industrial workers and technical teachers on the new technological application of computers in the automobile vehicles.

H_{O2}: There is no significant difference in the mean responses of industrial workers and technical teachers in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles.

H_{O3}: There is no significant difference in the mean responses of industrial workers and technical teachers on the new technological application of sensors as a means of providing information in modern automobile vehicles.

Methodology

Cross sectional survey research design was used to determine the technical skills requisites of auto mechanic students in the maintenance of modern vehicles in Nigeria. Survey research design was adopted because according to Olaitan and Nwoke (1999), survey research design is one in which a group of people or items is studied by collecting and analyzing data from people or items

considered to be representative of the entire group. The target population of the study was 340 consisting 180 industrial workers and 160 technical teachers gotten from technical colleges and from automobile maintenance and services units from Zuba in the Federal Capital Territory, Abuja, Kaduna State and Niger State. A convenient sampling technique was used to select 80 industrial workers and 80 technical teachers making up a total population of 160 respondents. A 30 item questionnaire structured on a 4-point scale response option was used to collect data from the respondents. The questionnaire was structured to indicate the degree to which respondents agree to each item as strongly agree(SA),agree(A),disagree (D) and strongly disagree(SD).The response category was assigned numerical values as 4,3,2,1.The questionnaire was validated by three lecturers, all from the Federal University of Technology Minna, Department of Industrial and Technology Education (ITE), to ascertain the level of appropriateness of the questionnaire items before administering it to the respondents. The weighted Mean and Standard Deviation (SD) were used to answer the research questions. Therefore items with mean score below 2.50 were regarded as disagreed while those with mean score of 2.50 and above were regarded as agreed. The t-test statistics was used to test the hypotheses at 0.05 level of significance. The t-critical (t-table) value for accepting or rejecting the null hypotheses was ±1.98 and 158 degree of freedom.

Results
Research Question One and Hypothesis One
Research Question One: What are the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles?

H_{01}: There is no significant difference in the mean responses of industrial workers and technical teachers on the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles.

Table 1: t-test analysis of mean responses of respondents on the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles.

S/N	ITEM STATEMENT	X_1	SD_1	X_2	SD_2	t-cal	$\bar{X}_t$	REM
1	Knowledge of computer hardware components and software.	3.75	0.60	2.86	0.40	0.34	3.31	NS
2	Skills in operating different types of computers.	3.67	0.30	2.05	0.10	0.88	2.86	NS
3	Knowledge in identifying different types of computers.	3.70	1.20	2.11	0.30	0.62	2.91	NS
4	Knowledge in basic principles of electronic systems in automobiles.	3.69	0.36	3.40	0.70	1.25	3.05	NS
5	Basic knowledge in selection & identification of different types of computer scan tools.	3.70	1.21	3.03	0.65	1.21	3.37	NS
6	Skills in the use of scan tools to diagnose faults in vehicles.	3.33	0.83	2.82	1.27	0.60	3.08	NS
7	Skills in the use of code readers to read Diagnostic Trouble Code (DTC).	3.68	0.32	3.05	0.81	0.50	3.37	NS
8	Skills in interpreting DTC.	3.34	1.00	2.47	0.72	0.59	2.91	NS
9	Basic safety methodology in the use of computer scan tools and code readers.	3.00	1.39	3.06	0.63	0.50	3.03	NS
10	Basic skills in the handling and maintenance of scan tools.	3.01	1.29	3.75	0.74	0.21	3.38	NS

REM=Remark, **NS**=Not Significant, t- table value = ±1.98 at 158 degree of freedom.

Analysis on Table 1 shows that 10 of the items presented had their average mean values ranged from 2.86-3.38. This value are above the cutoff point of 2.50 which implies that the respondents agreed to the items as regards the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles. The t-test analysis from Table 1 revealed that all the items had their t-calculated (t-cal) values less than the t-table (t-tab) value of ±1.98. This implies that there was no significant (NS) difference in the mean ratings of the responses of the respondents on the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles. Hence the null hypothesis was accepted.

Research Question Two and Hypothesis Two
Research Question Two: What are the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles?
H_{O2}: There is no significant difference in the mean responses of industrial workers and technical teachers on the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles.

Table 2: t-test analysis of mean responses of respondents on the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles.

S/N	ITEM STATEMENT	X_1	SD_1	X_2	SD_2	t-cal	X_t	REM
11	Identification of various types of Electronic Control Unit (ECU) in automobiles.	3.20	0.75	2.80	0.11	0.46	3.00	NS
12	Knowledge in locating the position of ECU in different vehicles.	2.85	1.30	3.01	0.64	0.89	2.93	NS
13	Knowledge of the working principle of ECU.	3.22	0.45	2.58	0.81	0.78	2.90	NS
14	Basic skills in safe handling & maintenance of ECU.	3.70	0.56	3.10	0.72	1.43	3.40	NS
15	Knowledge of the concept of On Board Diagnostics (OBD) in motor vehicles.	3.60	0.45	2.30	1.05	1.23	2.95	NS
16	Skills in the programming & reprogramming of ECU to manufacturers' specification.	3.25	0.52	2.75	0.75	0.64	3.00	NS
17	Skills in determining the failure of semi-conductor components linking the ECU to the vehicle.	3.55	0.28	2.11	0.23	0.56	2.83	NS
18	Skills in recognizing & interpreting signals from the ECU.	3.50	0.44	3.80	0.42	0.55	3.65	NS
19	Skills in carrying out basic soft soldering of vehicles' electronic wiring.	3.46	0.44	3.21	0.35	0.54	3.33	NS
20	Knowledge in understanding and interpreting electrical circuits in vehicle.	3.60	0.39	3.48	0.23	0.35	3.54	NS

REM=Remark, **NS**=Not Significant, t- table value = ±1.98 and 158 degree of freedom.

The data analyzed in Table 2 revealed that all the items had their mean values ranged from 2.83-3.65. Since the values are above the cutoff point of 2.50 , it indicates that the respondents agreed to all the items as the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles. The t-test analysis from Table 2 revealed that all the items had their t-calculated (t-cal) values less than the

t-table (t-tab) value of ±1.98.This implies that there was no significant (NS) difference in the mean ratings of the responses of the respondents on the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles. Hence we uphold the null hypothesis for the 15 items.

Research Question Three and Hypothesis Three

Research Question Three: What are the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles?

H_{O3}: There is no significant difference in the mean responses of industrial workers and technical teachers on the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles.

Table 3: t-test analysis of mean responses of respondents on the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles.

S/N	ITEM STATEMENT	X_1	SD_1	X_2	SD_2	t-cal	$\overline{X}_t$	REM
21	Skills in identification & locating of various sensors in vehicles.	3.71	0.81	3.59	0.84	0.44	3.65	NS
22	Knowledge of the principle of operation of sensors in motor vehicle.	3.40	0.13	3.30	0.48	0.83	3.35	NS
23	Skills in identifying & diagnosing faulty sensors in vehicle.	3.10	0.81	3.20	0.59	0.67	3.15	NS
24	Skills in replacing faulty sensors in motor vehicle.	3.00	0.54	3.06	0.58	1.26	3.03	NS
25	Knowledge of the function of sensors in vehicles.	3.14	0.59	3.00	0.70	1.17	3.07	NS
26	Skills in the identification & interpretation of Vehicle Identification Number (VIN).	3.19	0.92	3.11	1.01	0.65	3.15	NS
27	Skills in recognizing & translating warning signs and trouble codes from sensors.	2.43	0.88	3.65	0.81	0.53	3.04	NS
28	Skills in sensor maintenance, replacement and safe handling.	3.18	1.77	3.10	0.74	0.56	3.14	NS
29	Identify & select appropriate test tools & equipment for any test on sensors.	2.50	0.73	2.56	1.07	0.66	2.53	NS
30	Recognize & interpret various electrical signals from sensors.	3.02	0.73	3.40	0.90	0.23	3.21	NS

REM=Remark, NS=Not Significant, **t- table value** = ±1.98 and 158 degree of freedom.

Table 3 shows that all the items presented had their weighted mean values ranged from 2.53-3.65.This values are above 2.50 indicating that the respondents agreed to the items as the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles. The t-test analysis from Table 3 revealed that all the items had their t-calculated (t-cal) values less than the t-table (t-tab) value of ±1.98.This implies that there was no

significant (NS) difference in the mean ratings of the responses of the respondents on the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles. Therefore we fail to reject the null hypothesis.

Findings of the Study
The following are the summary of major findings of the study.

On the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles, the study revealed amongst others that the students need:

1. Knowledge in identifying types of computer, computer hardware components, software and also skills in operating various types of computer.
2. Knowledge in basic principles of operation of electronic systems in automobiles.
3. Basic knowledge in selection & identification of different types of computer scan tools.
4. Skills in the use of scan tools and code readers in diagnosing faults and interpreting Diagnostic Trouble Code in vehicles.
5. Basic skills in safety methodology for safe handling and use of computer scan tools and code readers.

Regarding the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles, the study revealed among others that the students need:

1. Skills in the operation of Electronic Control Unit (ECU) & in the identification & location of various types of ECUs in vehicles.
2. Basic skills in safe handling & maintenance of ECU, and in programming & reprogramming of ECU to manufacturers' specification.
3. Knowledge of the concept of On Board Diagnostics (OBD) and its function in motor vehicles.
4. Skills in determining the failure of semi-conductor components linking the ECU to the vehicle.
5. Skills in recognizing & interpreting signals from the ECU.

While on the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles, the study also revealed that the students need:

6. Skills in operation, identification and locating of various sensors in vehicles.
7. Skills in sensor maintenance, diagnosing faulty sensors and replacement of faulty sensors in vehicle.
8. Skills in the identification and interpretation of Vehicle Identification Number (VIN).
9. Skills in recognizing and translating warning signs and trouble codes from sensors.
10. Skills in recognizing and interpreting of various electrical signals from sensors, and to select appropriate test tools v equipment for any test on sensors.
11. The three null hypotheses formulated for the study were upheld.

Discussion of Findings

Analysis from Table 1 revealed the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles. The study showed that in addition to the mechanical skills required by automobile mechanics students, they also need : knowledge in identifying types of computer, computer hardware components, software and also skills in operating various types of computer; knowledge in basic principles of operation of electronic systems in automobiles; knowledge in selection & identification of different types of computer scan tools; skills in the use of scan tools and code readers in diagnosing faults and interpreting Diagnostic Trouble Code in vehicles; and skills in safety methodology for safe handling and use of computer scan tools and code readers. To support the above findings, William & Donald (2008) revealed that for effective diagnoses, maintenance and repairs, automobile mechanics students need sound technical skills and knowledge in the operation and application of

computers because today's automobile workplace is now dominated with computer scan tools and varieties of diagnostic equipment and machines that require special computer training for its handling and usage.

A typical example of equipment requiring training for its handling is the automobile scan tool, a computerized device used to access on board diagnostic (OBD) information from the automotive computer memory. The scan tool assists the modern automobile mechanic in repairing the automobile by providing access to the vehicle sensor readings. According to Peter (2009) the scan tool help the modern auto mechanic to read diagnostic trouble code (DTC) reported by the Electronic Control Unit (ECU). DTC is a combination of alphabet and numbers which the ECU displays when there is a fault in the vehicle. Once the vehicle is repaired, the scan tool can be used to erase the diagnostic trouble code and to extinguish the check engine light. In addition, a scan tool reads codes, clear codes and can tell which parts need to be replaced. Odigiri and Ede (2010) stressed that, the need for a sound technical knowledge and skills on the use of computer scan tools by automobile maintenance personnel in the automobile workplace is paramount since without it, efficient diagnosis, maintenance and repairs cannot be carried out on modern vehicles.

To buttress the above finings, Odigiri & Ogwo (2013), stated that the extent of availability of technical knowledge and skills on the utilization of scan tools and varieties of other maintenance equipment and machines in the Nigeria automobile workplace is worrisome as most modern vehicle users visit auto mechanic workshops with fear of their vehicles been mal-repaired or temporarily repaired only to further worsen the situation later.

The agreement to all the items on Table 2 revealed that all the items are valid as regard to the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles. For effective maintenance and repairs of Electronic Control Units in modern vehicles, the automobile mechanics students' needs : skills in the operation of Electronic Control Unit (ECU) & in the identification & location of various types of ECUs in vehicles; skills in safe handling & maintenance of ECU, and in programming & reprogramming of ECU to manufacturers' specification; knowledge of the concept of On Board Diagnostics (OBD) and its function in motor vehicles; skills in determining the failure of semi-conductor components linking the ECU to the vehicle; and skills in recognizing & interpreting signals from the ECU among others. According to Hillier and Peter (2004), the technical skills required by automobile mechanics' students in the maintenance of Electronic Control Unit (ECU) has become necessary due to the multiple functions performed by the ECU in terms of receiving and transmitting signals and On board diagnostic information between sensors and actuators in modern vehicles.

The desire for automakers to achieve new legal and industry standard; necessitated the incorporation of many new sub-systems and system components into modern automobiles, thereby making the Electronic control unit more sophisticated and complex to maintain (Igwe *et al.*, 2017).He added that correct identification and selection of appropriate work tools is an imperative step to effective maintenance of the Electronic control unit in modern vehicles. The modern automobiles which are greatly characterized by numerous sensors and actuators for transferring and receiving electronic

messages or signals from the Electronic Control Unit (ECU) have further worsen the situation for a typical Nigerian auto mechanics whose training is deficient in the in programming & reprogramming of ECU to manufacturers' specifications.

The acceptance of the 10 items in Table 3 shows that the respondents agreed with the items as the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles. The study revealed among others that to safely handle and repair sensors in modern vehicles, automobile mechanics need : skills in operation, identification & locating of various sensors in vehicles; skills in sensor maintenance, diagnosing faulty sensors and replacement of faulty sensors in vehicle; skills in the identification & interpretation of Vehicle Identification Number (VIN); skills in recognizing & translating warning signs and trouble codes from sensors; skills in recognizing & interpreting of various electrical signals from sensors, and to select appropriate test tools & equipment for any test on sensors. According to Rajput (2007) skills in the interpretation and use vehicle identification number (VIN) in selecting appropriate components for replacement is highly needed by automobile mechanics to ensure accuracy and genuineness in components replacement in modern vehicles.

The opinions of the respondents on the technical skills requisites of auto mechanic students in the maintenance of modern vehicles in Nigeria was supported by Okorie (2000) who stated that the new technologies in modern automobiles demand new work skills and therefore new educational requirements. He added that common reactions to such changes in technology and occupational skills have been the re-training of workers to update their technical knowledge and vocational

skills. This in turn usually requires regular review of automobile technology curriculum in technical and technological institutions so that the school programs can reflect the actual demands in the automobile work place (Maigida, 2013).

On the hypotheses, the study found out that there was no significant difference in the mean ratings of the responses of the respondents on: the technical skills requisites of automobile mechanics' students in the application of computers in modern automobile vehicles; the technical skills requisites of automobile mechanics' students in the maintenance of Electronic Control Units (ECUs) of modern automobile vehicles, and the technical skills requisites of automobile mechanics' students in the application of sensor as a means of providing information in modern automobile vehicles. Hence the opinions of the respondents did not differ in all the items identified. The implication of the study is that the technical skills posses by automobile mechanics students is not satisfactory significant to cope with the new technologies in modern vehicles. As a result the motor vehicle mechanics' students' are faced with a lot of problems in the use of modern computerized scan tools and equipment, which calls for the need to initiate improvement techniques needed to empower automobile mechanics student with the requisite technical skills for the maintenance of modern vehicles. Therefore we uphold the null hypotheses for all the items.

Conclusion

Based on the findings of the study, it is glaring that the technical skills posses by automobile mechanics students is not satisfactorily significant for effective maintenance and repair of modern vehicles. As a result the auto mechanics' students' are faced with a lot of challenges in the repair of modern vehicles. This

further threatens and discourages automobile mechanics students from practising their trade upon graduation. Therefore, there is need to empower the motor vehicle mechanics' students with the requisite skills for effective performance in automobile diagnoses, maintenance and repairs.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. The National Business and Technical Examinations Board (NABTEB) in collaboration with National Board for Technical Education (NBTE) should periodically update the technical college motor vehicle mechanics' curriculum and also develop strategies on how to monitor and ensure that instructions in the new technological innovations in automobiles are fully and regularly implemented in technical colleges so as to enable students to acquire the requisite technical skills for effective maintenance of modern automobiles.

2. Curriculum planners and developers in collaboration with National Universities Commission (NUC) and National Commission for Colleges of Education (NCCE), should periodically and regularly update the curriculum for training of automobile teachers to incorporate the new technological innovations in automobiles in order to equip the teachers with the requisite technical and pedagogical skills needed to facilitate teaching and learning of new work skills.

3. Organizing retraining courses to update and equip automobile students with the requisite skills for effective maintenance of modern vehicles.

4. Auto mechanics teachers seek support from automobile industry to create a strong linkage between automobile maintenance industry and technical colleges to enhance availability of new technological information and training.

5. Appealing to Government at various levels, relevant ministries and industries, wealthy Nigerians and other stakeholders should collaborate to fund and supply adequate automobile training facilities to technical colleges.

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