UPSKILLING REQUIREMENTS OF MOTOR VEHICLE MECHANICS FOR MODERN VEHICLE REPAIRS AND MAINTENANCE IN KADUNA METROPOLIS, NIGERIA

Abstract

This study determined the up-skilling requirements of motor vehicle mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria. Two research questions and two hypotheses were formulated for the study. The sample (N=154) informal and formal author mechanics was taken from a population of 217 author mechanics in Kaduna Metropolis. The study adopted survey research design. Means and standard deviations were used to answer the research questions while the z-test statistic was used to test the null hypotheses at 0.05 level of significance. Findings of the study revealed among others that the motor vehicle mechanics in Kaduna State, Nigeria require several relevant motor vehicle maintenance and repair skills to enhance their performance in repairing modern vehicles such as identification of different sensors in vehicles, use of diagnostic scan tools and equipment. The study recommended among others that: the Government, formal sector automobile industries as well as non-governmental organizations should intensify efforts at providing modern motor vehicle training facilities to enhance professional automobile maintenance and repair practice in Kaduna Metropolis, Nigeria.

Keywords: UpSkilling Requirements, Motor Vehicle Mechanics, Maintenance.

Introduction

Globally today, skill is a great necessity for self-reliance and employability. Atsumbe (2017) pointed out that skills are vital for poverty reduction, economic recovery and sustainable development. Skill according to Adigun (2003) referred to expertise or ability developed in the course of training and experience demonstrated by an individual's ability 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 technical knowledge, manual skills, analytical skills, problem solving skills, and higher order thinking skills needed to perform effectively in the automobile workplace. The motor vehicle mechanics which is the focus of this study can be operationally defined as a category of practitioners responsible for the repairs and maintenance of vehicles in the informal automobile sector for the diagnoses, repairs and

maintenance of vehicles in order to keep them in good operational and road worthy condition. The vehicles cannot remain new forever, as the parts breakdown and wear out, and so, must undergo maintenance and repairs (Akinola & Ogedengbe, 2005). Maigida (2014) defined automobile maintenance as the act or practice of keeping the motor vehicle in good working condition to make it road worthy.

It is the repair activity carried out on vehicles makes them unaltered, and if altered, restores them to their original state. Today, the motor vehicle has become indispensable means of transportation, therefore, adequate fault diagnoses which requires periodic up-skilling of motor vehicle mechanics in its repair and maintenance becomes necessary.

Up-skilling is the process of improving workers skills in order to advance their performance in their place of work. In automobile trade, up-skilling implies improving motor vehicle mechanics work skills by equipping them with the requisite diagnostic and applied skills for effective maintenance and repairs of modern vehicles. Up-skilling has become a necessity for motor vehicle mechanics because of the numerous technological innovations, changes and advancement in modern vehicles inform of increasing use of computerized and electronic systems, sub systems, sensors and actuators to achieve better engine output, low emission, safety and fuel economy. Muhammad, Azlan and Audu (2014) said it is because emphasis in the automobile industry has been shifted from pure mechanical system to automobile mechatronics. Automobile mechatronics is a field of motor vehicle engineering that integrates mechanical, electrical and computer-based technologies in the engineering design, production and maintenance of vehicles (Hillier, Crombes & Rogers, 2006).Technological dynamism coupled with the emergence of these new technologies has however, influenced modern vehicles. Harnessing new technologies into the vehicles have made the modern automobiles an assemblage of a group of sophisticated technologies (Schwaller, 1993).

These technological complexities of today's vehicle have created both an extensive skill demand as well as abundant opportunities for those who seek careers in the automotive industry. Motor vehicle mechanics nowadays must have well-grounded skills that would adequately prepare them to repair and maintain contemporary vehicles, as well as adapt to

future changes in the industry. For instance, a solid foundation in mathematics is necessary for various problem solving and diagnostic procedures. Basic physical science and physics principles are seen throughout the diagnostics process and in service and repair procedures. Ogwo (2004) revealed that an electrical/electronic background would be essential for reading and interpreting circuit diagrams as well as measuring electrical parameters of voltage, current, resistance and power.

All these are geared towards equipping motor vehicle mechanics with the requisite diagnostic and applied skills needed for improved performance in vehicle repairs and maintenance. To support this, the International Labour Organization (ILO, 2009) revealed that employers are seeking employees who are able to flexibly acquire, adapt, apply and transfer their knowledge and skills to different contexts and under varying technological conditions and to respond independently and creatively to innovations. Kirpal (2006) was of the opinion that for automobile mechanics to retain their job, they must undergo up-skilling in order to acquire sufficient work skills necessary to adjust and cope with the innovations in modern vehicles.

The worrisome situation in Nigeria according to Ogwo (2004) and Raymond (2007) is that diagnostic and applied skills are not obtainable in the informal motor vehicle sector due to the defects that characterize the informal apprenticeship system used for training automobile mechanics in Nigeria. Apprenticeship vocational training for motor vehicle mechanics is characterized by non-existence of a written curriculum, entry requirements and national certification. Maigida and Abutu (2010) revealed that master craftsmen decide out of simple experience what the apprentice should learn and the skill acquisition is usually through observation and imitation of the master craftsmen. They added that apprenticeship system involves the use of less sophisticated tools and usually produces motor vehicle mechanics who are usually unable to keep pace with innovations in modern automobiles. Okoro (1993) similarly revealed that the apprenticeship training programme is inadequate because they are lacking in theoretical content. He equally pointed out that the apprentice is told what to do, but not why they have to do it in the

way specified. What is taught to the apprentice depends on the job or maintenance problem at hand.

Ogwo (2004) revealed that, the mode of training and instruction is mostly by observation, practice, and trial by error. The garages or shops where the maintenance activities are carried out are of low capital base and are dilapidated. Maintenance centres that are used are either wrongly located on slippery terrains, under tree sheds, canopy made of banana or palm fronds. Similarly a close look at the equipment being used reveals the extent of malpractices by these motor vehicle mechanics who specialize in using wrong tool for jobs. In most places, service pits are not available and where available, there is no reinforcement at the sides to prevent free fall of objects and humans. This makes their creative and innovation abilities not to be developed. Hence, the mechanics are unable to cope with new situations different from their previous experiences. These defects in the apprenticeship training system must be checked. Checking these defects therefore requires up-skilling of motor vehicle mechanics even in the use of modern specialized diagnostic equipment and machines to analyze vehicle faults, effect adjustment and repairs to specifications in line with technological advancement in the auto industry.

Statement of the Problem

The increase in the complexity of modern vehicles brought about by technological innovations has created problems for motor vehicle mechanicsin the diagnostics, repairs and maintenance of new breeds of vehicles. Similarly, the high level of usage of new vehicles coupled with the rapid inflow of used vehicles into Nigeria calls for urgent need for very efficient and effective maintenance of these vehicles (Odigiri and Ede, 2010). Efficient maintenance and repairs of modern vehicles by motor vehicle mechanics might be difficult due to their deficiency in the needed skills for repairing modern vehicles. Bosede (2015) reported that modern vehicles come with contemporary technology which many mechanics are not familiar with. But because of desperation to stay in business, many motor vehicle mechanics pretend to know everything about the vehicle so that they do not lose customers therefore fixing one problem and resurfacing another one as a result of guess work. Many cars are now fully automated requiring that any mechanic who handles them must possess basic knowledge to diagnose faults and rectify them perfectly.

The concern of this study under investigation therefore is: what are the up-skilling requirements of motor vehicle mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria?

Objectives of the Study

The study explored ways to determine the:

1. Skills possessed by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna Metropolis, Nigeria.
2. Up-skilling needs of Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna Metropolis, Nigeria.

Research Questions

The following research questions guided the study, what are the:

1. Skills possessed by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna Metropolis, Nigeria?
2. Up-skilling needs of Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna Metropolis, Nigeria?

Statement of Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance to guide the study:

H_{O1}: There is no significant difference in the mean responses of informal sector motor vehicle mechanics and formal sector automobile mechanics on the skills possessed by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna Metropolis, Nigeria.

H_{O2}: There is no significant difference in the mean responses of informal sector motor vehicle mechanics and formal sector automobile mechanics on the up skilling needs required by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna Metropolis, Nigeria.

Population for the Study

The target population of the study comprised 217 registered informal sector Motor Vehicle Mechanics and formal sector automobile mechanics spread across the 21 registered vehicle repairs and maintenance

workshops in Kaduna town. The population size was obtained from the Nigerian Automobile Technicians Association (NATA) – Kaduna State Chapter (State Code: KD 019). The sample for the study was taken from Kaduna metropolis, Nigeria. The choice of Kaduna metropolis was due to the fact that there are high concentrations of modern vehicles as well as clusters of vehicle maintenance and repair workshops in Kaduna metropolis.

Research Methodology

The study employed descriptive survey research design. The design was chosen because it is effective in seeking peoples view about a particular issue that concerns them through the use of questionnaire (Uzoagulu, 2011). Descriptive survey design was considered suitable since the study sought information from a sample that was drawn from a population using questionnaire. The questionnaire was validated by three senior lecturers, pilot tested in Abuja and reliability coefficient found to be 0.91 using Cronbach's Alpha reliability statistic. Means and standard deviations were utilized to answer the research questions while z-test statistic was utilized to test the hypotheses at 0.05 level of significance.

Decision on the items was based on Grand Mean ($\bar{x}_{A)}$ with respect to limit of numbers on the 5-point scale used VHP/SA= Very Highly Possessed/Strongly Agree (4.50 - 5.00), HP/A= Highly Possessed/Agree (3.50 - 4.49), P/D= Possessed/Disagree (2.50 - 3.49), MP/SD= Moderately Possessed/Strongly Disagree (1.50 - 2.49) and NP/U= Not Possessed/Undecided (0.50 - 1.49)

Results

Research Question One

What are the skills possessed by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria?

The data collected in respect of Research Question 1 are shown in Table 1.

Table 1

Means and standard deviations of responses on the skills possessed by motor vehicle mechanics for modern vehicle repair and maintenance in Kaduna State, Nigeria.

S/N	Items	$\bar{X}_1$	SD 1	$\bar{X}_2$	SD 2	$\bar{X}_A$	SD A	Decision
1	Selection of appropriate work tools for new automobile system.	1.22	.42	2.05	1.67	1.63	1.04	MP
2	Use of diagnostic scan tools &equipment.	1.27	.45	1.97	1.62	1.62	1.04	MP
3	Identification of different sensors in vehicles.	1.30	.46	2.09	1.64	1.70	1.05	MP
4	Proficient in handling different actuators in vehicles.	1.22	.42	2.04	1.68	1.63	1.05	MP
5	Procedures for servicing and repair of new sub systems.	1.27	.45	2.19	1.68	1.73	1.07	MP
6	Use of code readers to trace faults in cars	1.27	.45	2.00	1.68	1.64	1.06	MP
7	Interpretation of diagnostic trouble code (DTC).	1.32	.47	1.29	1.02	1.31	.75	NP
8	Operation of on-board diagnostic (OBD).	1.32	.47	2.43	1.79	1.88	1.13	MP
9	Identification of various versions of OBD-enabled vehicles.	1.27	.45	1.68	1.38	1.47	.92	NP
10	Interpretation of vehicle identification number (VIN) during component replacement.	1.27	.45	1.99	1.49	1.63	.97	MP
11	Application of the principle of operation of electronic control unit (ECU) in modern vehicles.	1.24	.43	2.05	1.67	1.65	1.05	MP
12	Identifying quality automobile components.	1.32	.47	1.97	1.62	1.65	1.05	MP
13	Application of safety devices and equipment.	1.38	.49	2.09	1.64	1.74	1.07	MP
14	Identifying the correct connectors with the control module for the different electronic sub-systems in automobiles.	1.38	.49	2.04	1.68	1.71	1.09	MP
15	Utilization of electronic component during trouble shooting operations.	1.32	.47	2.19	1.68	1.76	1.08	MP

Table 1 (Continued)

16	Identification of the correct fluids for the different new sub systems in modern vehicles.	1.27	.45	2.00	1.68	1.64	1.06	MP
17	Tracing of electrical/ electronic circuits by wire codes, sizes and number codes.	1.24	.43	1.29	1.02	1.27	.73	NP
18	Identifying the diagnostic link when using modern diagnostic tools to access diagnostic trouble code.	1.22	.42	2.43	1.79	1.82	1.10	MP
19	Selection of test tools & equipment for carrying out test operations on modern vehicles.	1.30	.46	1.68	1.38	1.49	.92	NP
20	Be able to determine the failure of semi-conductors.	1.38	.49	1.99	1.49	1.69	.99	MP

N1=117, N2=37, Total N=154

Key: N1= Number of informal sector motor vehicle mechanics (ISMVM), N2= Number of formal sector automobile mechanics (FSAM), $\bar{x}_1$= mean of ISMVM, $\bar{x}_2$= mean of FSAM, $\bar{x}_A$= Grand mean of both groups of respondents, SD_1= Standard Deviation of ISAM, SD_2= Standard Deviation of FSAM, SD_A= Standard Deviation of FSAM and ISAM, MP= Moderately Possessed, NP=Not Possessed.

The data shown in Table 1 reveals the skills possessed by Informal Sector Motor Vehicle Mechanics (ISMVM) as well as Formal Sector Automobile Mechanics (FSAM).Table 1 reveals that the skills with average mean scores between 1.62-1.88 are moderately possessed by both group of respondents while the skills with average mean scores between 1.27- 1.49 are not possessed by both group of respondents. This implies that the respondents agreed that some of the listed automobile mechanics skills are moderately possessed by both group of respondents while some others are not possessed. The standard deviation of the listed items ranged from 0.73-1.13 whose difference is less than 1.00. This implies that the respondents were not far from the mean and from one another in their responses to research question one.

Research Question Two

What are the up-skilling needs of Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria

Table 2

Mean Responses of the Respondents on the Up-Skilling Need of Motor Vehicle Mechanics for Modern Vehicle Repairs and Maintenance in Kaduna State, Nigeria.

S/N	Items	$\bar{x}_1$	$\bar{x}_2$	p-value, Sig. (2-tailed)	Alpha Level	Decision
1	Ability to select appropriate work tools for new automobile systems.	4.41	1.63	.000	0.05	Significant
2	Competent in the use of diagnostic scan tools & equipment.	4.19	1.62	.000	0.05	Significant
3	Identification of different sensors in vehicles.	4.37	1.70	.000	0.05	Significant
4	Ability to handle different actuators in vehicles.	4.45	1.63	.000	0.05	Significant
5	Carrying out correct procedures for servicing and repair of new sub systems.	4.24	1.73	.000	0.05	Significant
6	Utilization of code readers to trace faults in modern vehicles.	4.16	1.64	.000	0.05	Significant
7	Interpretation of diagnostic trouble code (DTC).	4.70	1.31	.000	0.05	Significant
8	Operation of on-board diagnostic (OBD) equipment.	4.67	1.88	.000	0.05	Significant
9	Conversant in the identification of various versions of OBD-enabled vehicles.	4.49	1.47	.000	0.05	Significant
10	Interpretation of vehicle identification number (VIN) during component replacement.	4.49	1.63	.000	0.05	Significant
11	Application of the principle of operation of electronic control unit (ECU) in modern vehicles during practice.	4.55	1.65	.000	0.05	Significant
12	Competent in identifying quality automobile components.	4.54	1.65	.000	0.05	Significant
13	Appropriate application of safety devices and equipment in modern vehicles.	4.43	1.74	.000	0.05	Significant
14	Identification of the correct connectors with the control module for the different electronic sub-systems in automobiles.	4.65	1.71	.000	0.05	Significant

Table 2 (Continued)

15	Ability to use electronic component during trouble shooting operations.	4.77	1.76	.000	0.05	Significant
16	Conversant with the correct fluids for different new sub systems in modern vehicles.	4.50	1.64	.000	0.05	Significant
17	Ability to correctly trace electrical/ electronic circuits by wire codes, sizes and number codes.	4.19	1.27	.000	0.05	Significant
18	Identification of diagnostic link when using modern diagnostic tools to access diagnostic trouble code.	4.39	1.82	.000	0.05	Significant
19	Utilization of test tools & equipment for carrying out test operations on modern vehicles.	4.54	1.49	.000	0.05	Significant
20	Ability to determine the failure of semi-conductor by testing.	4.72	1.69	.000	0.05	Significant

Key: N1=Number of informal sector motor vehicle mechanics, N2=Number of formal sector motor vehicle mechanics, $\overline{x}_1$=mean of skill required, $\overline{x}_2$= mean of skills possessed.

The up-skilling need of Automobile Mechanics for modern vehicle repairs and maintenance in North-West, Nigeria is therefore presented in Table 2 above. Since the p-value, Sig. (2-tailed) (.000) is less than 0.05, it implies that there is significant difference in the mean responses of the respondents as regards the skill required and skill possessed. Therefore the motor vehicle mechanics working in informal and formal sector needs up-skilling to enhance their performance in modern vehicle repairs and maintenance.

Hypothesis 1

There is no significant difference in the mean responses of informal sector motor vehicle mechanics and formal sector automobile mechanics on the skills possessed by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria.

Table 3

z-test Analysis of the Mean Responses of the Respondents on the Skills Possessed by Motor Vehicle Mechanics for Modern Vehicle Repairs and Maintenance in Kaduna State, Nigeria.

Group	N	$\bar{x}$	SD	df	z-value	p-value, Sig. (2-tailed)	Alpha Level	Decision
ISMVM	117	2.15	1.69	152	22.203	.000	0.05	Rejected
FSAM	37	1.29	0.45					

*Significant at $p \leq 0.05$.

Key: p-value=probability value calculated by the computer.

Table 3 shows that the p-value, is less than 0.05, it implies that there is significant difference in the mean responses of the respondents. Therefore the null hypothesis regarding the skills possessed by Motor Vehicle Mechanics for modern vehicle repair and maintenance in Kaduna State, Nigeria is rejected. Hence, there is a significant difference in the mean responses of informal sector motor vehicle mechanics and formal sector automobile mechanics on the skills possessed by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria.

This implies that the respondents agreed that the listed motor vehicle mechanics skills are not fully possessed by both formal and informal sector motor vehicle mechanics.

Hypothesis 2

There is no significant difference in the mean responses of informal sector motor vehicle mechanics and formal sector automobile mechanics on the skills required by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria. z-test Analysis of the Mean Responses of the Respondents on the Up skilling Needs Required by Motor Vehicle Mechanics for Modern Vehicle Repairs and Maintenance in Kaduna State, Nigeria.

Table 4

Group	N	$\bar{x}$	SD	Df	z-value	p-value, Sig. (2-tailed)	Alpha Level	Decision
ISAM	117	4.84	0.37	152	20.843	.000	0.05	Rejected
FSAM	37	4.08	0.97					

*Significant at $p \leq 0.05$.

Table 4 shows p-value, less than 0.05, it implies that there is significant difference in the mean responses of the respondents. Therefore null hypothesis regarding the skills required by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna, Nigeria is rejected. Hence, there is a significant difference in the mean responses of informal sector motor vehicle mechanics and formal sector automobile mechanics on the skills required by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria. This implies that the skills listed are very highly required by informal sector motor vehicle mechanics for modern vehicle repairs and maintenance while for the formal sector automobile mechanics' is not all very highly required.

Discussion of Findings

Findings emanating from Table 1 provided answer to research question one. It is shown that motor vehicle mechanics in Kaduna State, Nigeria do not possess the relevant skills needed for modern vehicle repairs and maintenance such as ability to appropriately select and competently apply and use computerized electronic diagnostic scan tools and equipment, ability to interpret Vehicle Identification Number (VIN) and Diagnostic Trouble Code (DTC) during component replacement and troubleshooting activities, as well as ability to apply principle of operation of electronic control unit (ECU) and on-board diagnostics in modern vehicles maintenance and repair practice. The non-possession of these relevant skills could be attributed to poor and outdated training facilities used for training motor vehicle mechanics in the informal sector automobile maintenance and repair trade.

The finding was supported by Eric (2008) who stated that the apprenticeship approach mostly used for training motor vehicle mechanics in Nigeria is defective and blamed the apprenticeship system of training

mechanics for not being adequate and relevant to offer enough of the skills needed to meet the challenges that are involved in the repair and maintenance of modern vehicles on Nigerian roads. Fapetu and Akinola (2008) attributed the skill deficiencies in motor vehicle mechanics to the sudden technological changes and trends that over took the automobile industry globally without a commensurate transformation in the automobile curriculum as well as non-implementation of best practice in the vehicle maintenance and repair trade. This could also be due to the fact that most auto mechanic workshops operate below standard expectation just for the sake of surviving and earning a living by any means. The non-possession of the required work skills for modern automobile repairs and maintenance could be the reason for the trial and error method mostly adopted by motor vehicle mechanics which makes them to sometimes ignorantly replace new components with less effective older version and also complicate minor faults during repairs. This is in consonance with the findings of Odigiri and Ogwo (2013) who found out that the trial and error practice of mechanics in most cases result in damages to functional systems and sub-systems of the vehicles hence this altered performance tends to hinder smooth operation of the entire motor vehicle.

The z-test statistics was used to test the first null hypothesis at 0.05 level of confidence on Table 3. Findings reveal that the p-value, Sig. (2-tailed) (.000) is less than 0.05. This implies that there is significant difference in the mean responses of the respondents. Therefore the null hypothesis regarding the skills possessed by motor vehicle mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria was rejected. Hence, there is a significant difference in the mean responses of informal sector motor vehicle mechanics and formal sector automobile mechanics on the skills possessed by automobile mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria.

This implies that the motor vehicle mechanics in Kaduna State, Nigeria are deficient in some of the relevant work skills needed for maintenance and repairs of modern vehicles.

Findings on Table 2 provided answer to research question two. This indicated that for effective repairs and maintenance of modern vehicle in Kaduna State, Nigeria, motor vehicle mechanics need up-skilling in modern equipment and tool usage and in adopting correct procedures for

servicing and repair of modern automobile systems as well as up-skilling in appropriate selection and competency in the use of computerized diagnostic scan tools and equipment in troubleshooting and repairing modern automobile faults; interpretation of Vehicle Identification Number (VIN) and Diagnostic Trouble Code (DTC) during component replacement and trouble shooting activities; application of principle of operation of electronic control unit (ECU) and on-board diagnostics in modern vehicles maintenance and repair practice.

This implies that the comparison between the skills required but not possessed is the skill gap or skill deficiency in the motor vehicle mechanics which becomes the up-skilling need of motor vehicle mechanics for modern vehicle repairs and maintenance in Kaduna State, Nigeria. In support of this findings, Agbata (2000) found out that the increasing number of new electronic systems and sub-systems in modern vehicles, intended to improve upon their emission rate, safety, economy and comfort among other things, have made them more sophisticated and complex to maintain and thus require up-skilling of motor vehicle mechanics in the required work skills to enhance their performance. Similarly Akinola and Ogedengbe (2005) found out that the Nigeria automobile mechanics lacked the requisite automobile mechatronics skills needed for effective maintenance of modern automobiles and therefore requires up skilling in the automobile mechatronics skill content for effective performance on the job.

The z-test statistics was used to test the second null hypothesis at 0.05 level of confidence on Table 4. Findings reveal that the p-value, Sig. (2-tailed) (.000) is less than 0.05. It implies that there is significant difference in the mean responses of the respondents. Therefore the null hypothesis regarding the up skilling needs required by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in North-West, Nigeria was rejected. Hence, there is a significant difference in the mean responses of informal sector motor vehicle mechanics and formal sector automobile mechanics on the up skilling needs required by Motor Vehicle Mechanics for modern vehicle repairs and maintenance in North-West, Nigeria. This implies that several skills are required by automobile mechanics for effective maintenance and repairs of modern vehicles.

Conclusion

The study determined the up-skilling requirements of motor vehicle mechanic for modern vehicle repairs and maintenance in Kaduna Metropolis. It was found out that motor vehicle mechanics in Kaduna Metropolis, Nigeria requires several relevant automobile maintenance and repair skills such as ability to appropriately select and competently apply and use computerized electronic diagnostic scan tools and equipment in troubleshooting and repairing modern automobile faults; ability to interpret Vehicle Identification Number (VIN) and Diagnostic Trouble Code (DTC) during component replacement and troubleshooting activities; as well as ability to apply principle of operation of electronic control unit (ECU) and on-board diagnostics in modern vehicles maintenance and repair practice. It was also found out that the motor vehicle mechanics in Kaduna Metropolis, Nigeria do not possess that required automobile mechanic skills for modern vehicle repairs and maintenance. In conclusion, based on the findings from the study, the motor vehicle mechanics need up-skilling especially in the informal sector because they do not possess most of the skills required for efficient maintenance and repairs of modern vehicles.

Recommendations

Based on the findings and discussions from this study, the following recommendations were made:

1. Non-Governmental Organizations should invest in the informal motor vehicle maintenance and repair sector to assist in providing modern training facilities such as computerized diagnostic scan tools and equipment to enhance acquisition of relevant modern automobile mechanic skills required for effective maintenance and repairs of modern vehicles. Kaduna Metropolis Governments should develop and implement training and retraining programmes to equip motor vehicle mechanics with the relevant modern up skilling needs required for effective maintenance and repairs of modern vehicles. This will enable them to possess the needed skills.

2. The informal sector mechanics should be given periodic orientation on the need to embrace technological changes and strive to acquire new innovative maintenance and repair skills required to enhance their performance in the automobile

mechanic occupation and the Nigerian Government in collaboration with formal sector automobile service centers should establish a standard code of practice to control motor vehicle mechanics maintenance and repair activities to promote acquisition of the required automobile mechanics skills.

REFERENCES

Adigun, A.O. (2003). *Introduction to Vocational and Technical Education with Principles and Methods of Teaching Skills*. Lagos: Ladun Publication and Consultancy Services.

Agbata, V.I.N. (2000).Relevance of the Technical College Auto Mechanics Curriculum to the Automobile Industry in Anambra State. Unpublished M.Ed. Thesis, Department of Vocational Teacher Education, University of Nigeria, Nsukka.

Akinola, B. & Ogedengbe, T. (2005). *Basic Automobile Technology*. Akure Olajuyin Printers.

Atsumbe, B. N. (2017). Implementing TVET towards Employment Generation and Poverty Reduction in Nigeria: The Good and The Bad. FutMinna Inaugural Series 61, pg 14.

Bosede, O. O. (2015). Nigeria Legion of Illiterate Auto-Mechanics. Retrieved on 24th July, 2019 from the punch online extra via www.punchng.com

Eric, V. H. (2008).*Sources of Innovation in Modern Automobiles*. Retrieved on August 4th 2019 from inno.googlebooks/data/html

Fapetu, O.P. & Akinola, A. O. (2008). Optimizing Auto-Repair Practice: Akure Metropolis as Case Study. *American Journal of Technology*. 11(4), 232-238.

Hillier, V. A. W., Coombes P. & Rogers D. (2006). *Power Train Electronics*. 5th Edition Nelson Thornes Ltd. U. K. 120 – 125.

International Labour Organization (2009).*Industry and Trade Summary: Motor Vehicle*.Washington Jossey Bass.

Kirpal, S. (2006).*Automobile Engineering (Part 2)*.Delhi: Lomus offset press.

Maigida, J.F.&Abutu F.(2010).Effect of Innovations on the Job Security and Performance of Automobile Mechanics Craftsmen and Master Craftsmen in Nigeria.*Journal of Science, Technology and Mathematics Education* 7(1), 113-119.

Maigida,J.F. (2014). A Survey of the Maintenance Practices among Auto Mechanics Craftsmen in Nigeria.*Journal of Information, Education, Science and Technology*,1(1),135-150.

Muhammad, M.I., Azlan, B.A. L. & Audu, R.(2014). An Appraisal of Technical Skills Possessed by Technical College Auto-Mechanics Graduates in Nigeria. *Journal of Industrial Engineering Letter, 4* (8), 1-8.

Odigiri, A.M. & Ede, E.O. (2010). Integration of New Technological Innovations into the Automobile Curriculum for Nigerian Technical College Programmes. *International Journal of Vocational and Technical Education.* 2 (5), 89-94.

Odigiri, A.M. & Ogwo, B.A. (2013*)*.Modern Automobile Maintenance in Nigeria: Technical Skills Needs of Technical College Students. *International Journal of Vocational Education and Training.*19 (2), 86-88.

Ogwo, B.A. (2004). *Informal Sector Technical Skills Development Experiences in the Maintenance of Modern Automobiles in Nigeria.* Retrieved on August 5th, 2019 from http://www.intech.unu.ed

Okoro, O. M. (1993).*Principles and Methods in Vocational and Technical Education in Nigeria.* University Trust publishers. Nsukka pg 58 – 59.

Raymond,E.(2007).Constraints affecting Electronics Servicing of Craftsmen in Minna Metropolis.*Journal of National Association of Teachers of Technology*, 6(2), 1-12.

Schwaller, A. E. (1993). *Motor Automotive Technology*. New York, Delmar publishers.

Uzoagulu, A.E. (2011). *Practical Guide to Writing Research Project Reports in Tertiary Institutions.* Enugu: John Jacobs Classic Publishers Ltd, p. 41 – 43.