INNOVATIONS IN MODERN AUTOMOBILES AND CORRESPONDING SKILL NEEDS OF AUTOMOBILE CRAFTSMEN IN NIGERIA

Lemo, Olusiji Olaseni (Ph.d),
Department of Vocational and Technical Education,

Tai Solarin University of Education, Ijebu-Ode.

+2347061003464

rossandlemo@yahoo.co.uk

Fadairo, Olatunji Oriola (Ph.d)
Department of Vocational and Technical Education,

Tai Solarin University of Education, Ijebu-Ode.

Abstract

This study was conducted to determine innovations in modern automobile and corresponding skill needs of automobile craftsmen in Nigeria. Two research questions were developed in

relation to what the study sought to find out. A structured Questionnaire containing 34 items was developed and used for data collection while 3 experts were engaged to face validate the instrument. The reliability coefficient of the instrument was found to be 0.78 using Cronbach Alpha Coefficient. The questionnaire was used for collecting data from 213 respondents made of Industrial-based supervisors in modern automobile garages and automobile technology teachers. The data collected were analyzed using descriptive statistics of mean and standard deviation to answer the research questions and inferential statistic of t-test to test the hypotheses of no significance at 0.05 level of significance. The study identified 13 innovations in modern automobiles and 21 corresponding skill needs of automobile craftsmen as regards ABS, EFI, EIS, and ETS . The study recommended among others that all the 21 identified skills be incorporated into automobile curriculum in technical colleges.

Keywords: OBD, Automobile craftsmen, innovation, automobile.

Introduction

Innovations in modern automobiles are birthed by technological advancement and consequently had changed the face of automobile repairs over the years. Modern automobiles repair require modern techniques of handling, diagnosis and maintenance. The basis for

regular maintenance of automobiles stem from the fact that irregular maintenance will birth major breakdown with corresponding cost implications on the part of the owner. Akpakpavi (2014) observed that the designs of modern automobiles have advanced to a very sophisticated level in comparism with the old ones. He noted that modern automobiles are being operated and controlled by computerized electrical sensors and that almost every other function within the engine is controlled by an onboard computer. Erjavec (2010) stated that today, most automotive systems, such as engines, braking, transmission, and steering systems, are controlled primarily by computers and electronic components. Fapetu and Akinola (2008) observed that modern automobiles come with electronic control unit (ECU) and other electronic gadgets which sense instant fault in the vehicle and immediately notifies the driver through the malfunction indication lamp (MIL) or dashboard display.

Malone (2006) cited in Lemo (2014), identified Anti-lock Braking System (ABS), Electronic Fuel Injection (EFI), Electronic Ignition System (EIS), Electronic Transmission System (ETS), Variable Valve Timing Intelligence (VVT), On- Board Detection and Diagnostic system (OBD), All Wheel Drive (AWD) system, All Wheel Steering (AWS), Active Suspension System (ASS) and Emission Control System (ECS) as innovations in modern automobile.

Uline, Mahon and Potter (2014) noted that the most recent innovations in automobiles involve engines becoming extremely advanced and use multiple technologies to increase its capabilities while maintaining efficient operation. Such innovative engine technologies that have been incorporated in many cars are cylinder deactivation (CD), start-stop technology (SST), variable valve timing (VVT), and direct injection (DI).

Isaac (2015) noted that the use of scan tools like On-Board Diagnostic (OBD) I, II and III are common place in the repair of automobiles in the manufacturer's approved service centers today. OBD is an automotive term referring to a vehicle's self-diagnostic and

reporting capability. OBD systems give the automobile craftsmen access to the status of the various vehicle sub-systems and a clue as to where to look at when a problem occurs on the automobile.

Automobile craftsmen are trained in the nation's technical colleges. Ede and Olaitan (2010) posited that the training of automobile craftsmen is geared towards imparting basic knowledge as well as training skills leading to the production of skilled craftsmen who will be enterprising, self-reliant and sufficiently competent to meet the demands in the world of work. The goal of training automobile craftsmen in Nigeria according to National Board for Technical Education (NBTE, 1985) is to produce competent automobile craftsmen with sound practical knowledge on diagnosing and carrying out repairs and/or maintenance on all types of Diesel and Petrol automobiles. Thus, the programmes for automobile craftsmen in Nigeria technical colleges is designed to produce competent maintenance craftsmen for all types of motor vehicle.

Lemo (2014) pointed out that only few automobile craftsmen fix anything right nowadays and that is why customers rumble about poor services. This he noted is not unconnected with the incorporation of modern gadgets in the modern automobiles without corresponding acquisition of new skills in understanding the principle.

Automobile maintenance and repairs ought not to be an issue of trial and error. It is apparently very important that these craftsmen should possess the competencies, abilities, knowledge, and skills necessary to carry out the repair process in an effective and efficient way. However, for proper maintenance of modern automobiles corresponding skills of diagnosis, troubleshooting and repairs are required. Anderson (2012) averred that with the computerization of modern automobiles there is greater need for technical colleges to equip their workshop with the modern equipment and facilities that can facilitate students to be abreast with the innovative skills that will give them a place in the industries. Hence, there is

need to identify innovations in modern automobiles and corresponding skill needs of automobile craftsmen in Nigeria.

Statement of the Problem

Modern automobiles come with sophisticated technologies that require expert handling. Since automobile craftsmen are trained to diagnose and repair old automobiles, an urgent need therefore arise to train these craftsmen in line with the latest innovations that surfaced with modern automobiles.

Purpose

This study investigated innovations in modern automobiles and corresponding skill needs of automobile craftsmen in Nigeria.

Specifically, the study identified:

1. Innovations in modern automobiles
2. Corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS

Research Questions

1. What are the innovations in modern automobiles?
2. What are the corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

$H0_1$: There is no significant difference in the mean responses of industrial-based supervisors and automobile technology teachers on innovations in modern automobiles

$H0_2$: There is no significant difference in the mean responses of industrial-based supervisors and automobile technology teachers on corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS

Methodology

Research Design

This study adopted a descriptive survey research design. According to Gall, Gall and Borg (2007) a survey is a method of data collection using questionnaire or interviews to collect data from a sample that has been selected to represent a population to which the findings of the data analysis can be generalized. The design was considered suitable for the study since it sought the opinions of Automobile technology teachers and industrial based supervisors without manipulation of any variable.

Area of the Study

The study was carried out in Southwest, Nigeria. Southwest, Nigeria is a coast where most of the modern vehicles are shipped into the country. Southwest, Nigeria comprised six states of Lagos, Ogun, Ondo, Oyo, Osun and Ekiti

Population

The population of this study was 213. This is made up of 41 automobile technology teachers and 172 automobile industrial based supervisors.

Sample and Sampling Technique

This study made use of no sampling technique due to manageable size of the population.

Instrument for the Study

A structured Questionnaire containing 34 items was developed and used for the study. The scaling responses for the instrument was based on adapted Likert Scale ratings viz: Strongly Agreed (SA) – 4, Agreed (A) – 3, Disagreed (D) – 2 and Strongly Disagreed (SD)-1. The instrument was validated by three experts and tested for reliability yielding a coefficient of 0.78 using Cronbach Alpha .

Data Collection

The instruments were administered on the respondents by the researchers and 10 research assistants. Due to adequate monitoring and guidance of the instrument, the whole 213 copies distributed were recovered.

Method of Data Analysis

The data collected were statistically analyzed using descriptive statistics of means and standard deviation to answer the research questions and inferential statistics of t-test to test the null hypotheses at 0.05 level of significance. A mean of 2.50 and above was considered positive and agreed upon, while a mean rating of less than 2.50 was regarded as negative and disagreed upon.

Results and Discussions

Research Question 1

What are the innovations in modern automobiles?

Hypothesis 1

There is no significant difference in the mean responses of industrial-based supervisors and automobile technology teachers on innovations in modern automobiles

Table 1 presents the data for answering research question 1 and hypothesis 1

Table 1: P-values and Mean ratings of respondents on innovations in modern automobiles

S/N	ITEMS STATEMENT	X	P-values	REMARKS	Ho
1.	Anti-lock Braking System (ABS)	3.64	0.56	Accept	NS
2	Electronic Fuel Injection (EFI)	3.09	0.14	Accept	NS
3	Electronic Ignition System (EIS)	3.32	0.97	Accept	NS
4	Electronic Transmission system (ETS)	3.06	0.19	Accept	NS
5	Variable Valve Timing (VVT)	3.15	0.10	Accept	NS
6	On- Board Detection and Diagnostic system (OBD)	3.22	0.13	Accept	NS
7	All Wheel Drive System (AWDS)	3.00	0.18	Accept	NS
8.	All Wheel Steering (AWS)	3.12	0.48	Accept	NS
9.	Active Suspension System (ASS)	3.84	0.22	Accept	NS
10.	Emission Control System (ECS)	3.55	0.43	Accept	NS
11.	Cylinder Deactivation (CD)	3.82	0.16	Accept	NS
12.	Start-stop Technology (SST)	3.74	0.63	Accept	NS
13.	Direct Injection (DI).	3.87	0.75	Accept	NS

The result presented in table 1 revealed that all the 13 items (items1- 13) had a mean range of 3.55 to 3.87. This indicated that the respondents agreed on all the 13 items as innovations in modern automobiles because their means were above the cut-off point of 2.50. The table also indicated that the items had their P-values greater than 0.05. This showed that there was no significant difference in the mean responses of industrial based supervisors and automobile technology teachers on innovations in modern automobiles. Therefore, the hypothesis of no significant difference was upheld for the items.

Research Question 2

What are the corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS?

Hypothesis 2

There is no significant difference in the mean responses of industrial-based supervisors and automobile technology teachers on corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS

Table 2 presents the data for answering research question 2 and Hypothesis 2

Table 2: P-values and Mean ratings of respondents on corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS

S/N	ITEMS STATEMENT	X	P-values	REMARKS	Ho

14.	**Anti-Lock Braking System (ABS)** Check and troubleshoot antilock brake control module	3.88	0.73	Accept	NS
15	Check and troubleshoot antilock hydraulic modulator	3.57	0.33	Accept	NS
16	Troubleshoot solenoid valve for brake circuit	3.78	0.98	Accept	NS
17	Check and troubleshoot antilock brake pump motor relay	3.82	0.16	Accept	NS
18	**Electronic Fuel Injection (EFI)** Fuel pressure checks	3.66	0.27	Accept	NS
19	Static fuel pressure test	3.74	0.63	Accept	NS
20	Residual fuel pressure test	3.74	0.63	Accept	NS
21	Running fuel pressure test	3.63	0.25	Accept	NS
22.	Dead head pressure check	3.86	0.74	Accept	NS
23.	Fuel volume test	3.39	0.29	Accept	NS
24.	Fuel pressure drop test	3.49	0.31	Accept	NS
25.	Scope test	3.73	0.65	Accept	NS
26.	Pump replacement	3.69	0.78	Accept	NS
27	**Electronic Ignition System (EIS)** Troubleshoot using voltmeter	3.74	0.63	Accept	NS
28	Troubleshoot using ohmmeter	3.88	0.73	Accept	NS
29	Troubleshoot using ammeter	3.12	0.48	Accept	NS
30	**Electronic Transmission System (ETS)** Check for leaks at the filler tube base	3.82	0.16	Accept	NS

31.	Check for leaks at the drain hole underneath the transmission	3.86	0.74	Accept	NS
32	Check for leaks between transmission and engine	3.66	0.27	Accept	NS
33	Check for leaks at the selector shaft	3.74	0.63	Accept	NS
34	Check for leaks at the speed sensor mounting point	3.06	0.19	Accept	NS

The result presented in table 2 revealed that all the 21 items (items 14- 34) had a mean range of 3.39 to 3.88. This indicated that the respondents agreed on all the 21 items as corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS because their means were above the cut-off point of 2.50. The table also indicated that the items had their P-values greater than 0.05. This showed that there was no significant difference in the mean responses of industrial based supervisors and automobile technology teachers on corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS. Therefore, the hypothesis of no significant difference was upheld for the items.

Discussion

Tables 1 and 2 presented the data for answering research questions 1 and 2 respectively. The findings of the study in line with research question 1 revealed innovation in modern automobile. The findings as exposed by table 1 agreed with the submissions of Erjavec (2010), Fapetu and Akinola (2008) and Malone (2006). Erjavec (2010) posited that modern automobile systems, such as engines, braking, transmission, and steering systems, are controlled primarily by computers and electronic components. Fapetu and Akinola (2008) added that modern automobiles come with electronic control unit (ECU) and other electronic gadgets which sense instant fault in the vehicle and immediately notifies the driver through the malfunction indication lamp (MIL) or dashboard display, while Malone (2006), identified Anti-lock Braking System (ABS), Electronic Fuel Injection (EFI), Electronic Ignition System, Electronic Transmission system, Variable Valve Timing Intelligence (VVT), On- Board Detection and Diagnostic system (OBD), All Wheel Drive (AWD) system, All Wheel Steering (AWS), Active Suspension System (ASS) and Emission Control System (ECS) as innovations in modern automobile.

Furthermore, the findings of the study as exposed by table 2 revealed corresponding skill needs of automobile craftsmen for innovations in modern automobile as regards ABS, EFI, EIS, and ETS. The findings in line with research question 2 were buttressed by the findings of Isaac (2015). Isaac noted that the use of scan tools like On-Board Diagnostic (OBD) I, II and III are common place in the repair of automobiles in the manufacturer's approved service centers today. This in the opinion of the researchers can be replicated in the nation's technical colleges. Similarly, the position of Anderson (2012) on the need to equip automobile workshops in the nation's technical colleges with modern equipment and facilities that will match the latest innovations in modern automobiles also supports the findings of this study.

Findings on the hypotheses revealed that there was no significant difference in the mean responses of industrial based supervisors and automobile technology teachers on innovations in modern automobiles and corresponding skill needs of automobile craftsmen as regards ABS, EFI, EIS, and ETS. This indicated that the professional experiences of the respondents did not significantly influence their responses. Therefore the hypotheses of no significant differences were upheld for the items.

Conclusion

This study has brought to fore innovations in modern automobiles and corresponding skill needs of automobile craftsmen in Nigeria. The researchers observed that automobile owners often leave garage where their automobiles were taken for repairs disappointed and that with findings posed by this study automobile owners would no longer be disappointed but be satisfied implication of which if not addressed would make automobile users not able to maintain their automobiles by experts with hands-on experience.

Recommendations

Based on the findings of this study, the following recommendations were put forward:

1. All the twenty-one (21) identified skills should be incorporated into automobile curriculum in technical colleges.
2. Modern equipment and facilities in automobile should be procured in the nation's technical colleges.
3. Automobile craftsmen should be trained to possess competencies, abilities, knowledge, and skills necessary to carry out the maintenance and repair process in an effective and efficient way.

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