

TRAINING NEEDS OF TECHNICIANS ON DIAGNOSING AND MAINTAINING AUTOMOBILES WITH ELECTRONIC TRANSMISSION SYSTEM

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Abstract

This study determined training needs of automobile technicians on diagnosing and maintaining automobiles with electronic transmission system. Research questions focused on the purpose of the study provided guidance. A 30-item self-developed questionnaire entitled "Training Needs of Automobile Technicians Questionnaire (TNATQ)" was used to collect data from 54 respondents. The TNATQ was validated by three experts and its reliability coefficient was established at .81 using Cronbach's Alpha Coefficient method. The data collected were analyzed using descriptive statistics. The study revealed 30 areas of training needed by automobile technicians in diagnosing and maintaining automobiles with electronic transmission system. The study recommended that automobile technicians should be trained on the use of relevant tools and equipment such as scan tools, oscilloscopes and multi-meters among others and also that automobile technicians should be trained in important areas of fault diagnosis and removal procedure.

Keywords: Training; automobile; electronic transmission system; technician

Introduction

Advancement in technology noticed in every area of human endeavour is a pointer to training and re-training of every meaningful citizenry whose goal is to remain relevant in the scheme of global development. Training according to Oke and Olakotan (2017) is a planned process designed to modify attitude, knowledge or skill through learning experience to achieve effective and better performance of an activity or range of activities. Training is the process of acquiring knowledge or skill that may be required in the performance of task or multiplicity of tasks (Olaosebikan, in Oke & Olakotan, 2017). The essence of training according to Solomon (2009) is to reduce gap between performances of workers in terms of work output such that the attainment of organizational goals become realities.

Strict observation on today's automobiles revealed that automobile technicians require ranges of new knowledge and skills required for troubleshooting, diagnosing, maintenance and repair. This is because skills and knowledge gained previously are no longer in consonance with the latest innovations in today's automobile. This position was reiterated by Bellis (2010) who observed that the responsibilities of the automobile technician in the maintenance sector have evolved from simple mechanical repair work to a high-level technology-related work as a result of the complexities of technological innovation on the modern automobile. Today, integrated electronic devices, systems and complex computers regulate and enhance

the operation and control of modern automobile engine and all other systems that make it work (Bellis, 2010). Similarly, Lemo and Fadairo (2016) also noted that modern automobiles repair require modern techniques of handling, diagnosis and maintenance as a result of innovations in modern automobiles. Hence, there is no doubt that repairs and servicing of modern automobiles requires modern automobile technicians whose skills and knowledge of automobile repair and maintenance have been upgraded via training and retraining on all aspects of automobile repair, maintenance and servicing.

The need for automobile technicians to acquire further training in the repairs and maintenance of modern automobiles stem from the fact that modern automobiles are being operated and controlled by computerized electrical sensors in which the engine, braking, transmission, and steering systems, are controlled primarily by computers and electronic control unit (ECU) (Fapetu & Akinola, 2008; Erjavec, 2010; Akpakpavi, 2014). Lemo (2014) pointed out that only few automobile technicians 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 in which modern automobiles operate and function.

It must be noted that modern automobiles operate on Electronic Transmission System (ETS). The Electronic

Transmission System (ETS) uses hydraulics to actuate the clutches and bands, but each hydraulic circuit is controlled by an electric solenoid. This simplifies the plumbing on the transmission and allow for more advanced control schemes. Therefore, with the introduction of Electronic Transmission System (ETS) in automobiles, drivers and automobile owners have tremendous benefits, some of which according to BMW (2015) are:

1. Increased driving safety by reducing fatigue. All shifts are automatic as opposed to manual transmissions which require more driver interaction.
2. Increased fuel economy through use of lock up torque converter.
3. Increased fuel economy through optimized shift points

In a similar vein, Know Your Parts (2016) noted that diagnosing, troubleshooting and repairing of automobiles with ETS require the knowledge of a scan tool, oscilloscope and a multi-meter among others. Also, the use of electrical tester, which is also an important tool that has an easy to use power test feature for detecting circuit resistivity is of utmost importance (Tim, 2016). This is because the knowledge and skills in the use of scan tool enables the automobile technician to check for communication faults between the Power train Control Module (PCM) and transmission controller if the vehicle has separate computers. Also, some electronic transmission problems may or may not set a fault code and turn on the MIL lamp, so scanning the PCM or transmission module for codes if there is a transmission-related complaint or driveability issue becomes imperative. Gary (2015) posited that scan tools offer the best bet for diagnosing automatic transmission problems.

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.

In view of these facts, Kun, Xiping and Xiangyu (2018) highlighted areas of concern in fault diagnosis and removal procedures on automobiles with electronic transmission system. Areas highlighted include:

confirmation of fault phenomenon, reading of fault code, and checking oil level and oil quality among others.

Consequently, reliance on primitive ways of automobile diagnosing, troubleshooting, maintenance and repairs without due diligence in the use of modern tools and equipment would continually pose untold challenges to automobile and automobile owners. Hence, this study becomes significant.

Statement of the problem

The damage done to automobiles by technicians who are breed of analogue system cannot be overemphasized. These damages done daily, have caused more harm than good to car owners, drivers and the society at large. It is in light of these harms done on the populace due to poor handling of automobiles that automobile technicians require training and retraining, so as to be conversant and be abreast of latest technologies in automobiles. The training and retraining if properly harnessed would afford automobile technicians to adequately troubleshoot, diagnose and repair automobiles without further causing any havoc on the customers and the society at large. This study determined training needs of automobile technicians in diagnosing and maintaining automobiles with electronic transmission system.

Specifically, the study identified training needs of automobile technicians in diagnosing and maintaining automobiles with electronic transmission system and training needs of automobile technicians in fault diagnosis and removal procedures on the same class of automobiles.

Methodology

This study adopted a descriptive research design of the survey type. Accordingly, Gall, Gall and Borg (2007) noted that 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 Mechanical Technology lecturers.

The study was carried out in Ekiti, Lagos and Ogun States, Nigeria. The population of this study was 54 mechanical technology lecturers. The study made use of no sampling technique due to the manageable size

of the population. Training Needs of Automobile Technicians Questionnaire (TNATQ) was developed and used for the study. The TNATQ contained 30 items guided by the raised research questions. The scaling responses for the instrument was based on adapted Likert Scale ratings viz: Highly Required (HR) – 4, Required (R) – 3, Slightly Required (SR) – 2 and Not Required (NR)-1. The instrument was validated by three experts in automobile technology and tested for reliability yielding a coefficient of 0.81 using Cronbach Alpha. The instrument was administered on the respondents by the researchers and the whole 54 copies distributed were duly recovered. The data

collected were statistically analyzed using descriptive statistics of means and standard deviation to answer the research questions. A mean of 2.50 and above was considered positive while a mean rating of less than 2.50 was regarded as negative.

Results

Research question 1

What are the training needs of automobile technicians in diagnosing and maintaining automobiles with electronic transmission system?

Table 1: Mean ratings of respondents on training needs of automobile technician in diagnosing and maintaining automobiles with electronic transmission system

S/N	Item Statements	X	S.D	Remarks
1	Training on the use of OBD I	3.73	0.54	Required
2	Training on the use of OBD II	3.65	0.68	Required
3	Training on the use of OBD III	3.61	0.62	Required
4	Training on the use of multi-meter	3.46	0.89	Required
5	Training on the use of oscilloscope	3.28	0.81	Required
6	Training on the use of electrical tester	3.44	0.70	Required
7	Training on the use of volt light tester	3.45	0.75	Required
8	Training on the use of amp clamp	3.29	0.84	Required
9	Training on the use of wire crimping tool	3.61	0.62	Required
10	Training on the use of pneumatic wrench	3.63	0.65	Required
11	Training on the use of positioning ring clamp	3.38	0.67	Required
12	Training on the use of micrometer	3.36	0.80	Required
13	Training on the use of dial indicator	3.31	0.69	Required
14	Training on the use of feeler	3.34	0.88	Required
15	Training on the use of hydraulic or electric lift	3.52	0.60	Required

The result presented in table 1 revealed that all the 15 items (items1- 15) had a mean range of 3.29 to 3.73. This indicated that the respondents agreed on all the 15 items as areas where automobile technicians require training because their means were above the cut-off point of 2.50. The standard deviation of the items also ranged from 0.60 to 0.89. This showed that

the respondents were close to one another in their responses.

Research question 2

What are the training needs of automobile technician in fault diagnosis and removal procedures on automobiles with electronic transmission system?

Table 2: Mean ratings of respondents on training needs of automobile technicians in fault diagnosis and removal procedures on automobiles with electronic transmission system

S/N	Item Statements	X	S.D	Remarks
16	Confirm fault phenomenon	3.34	0.88	Required
17	Read fault code	3.59	0.56	Required
18	Check oil level and oil quality	3.58	0.63	Required
19	Check and adjust accelerator pedal cable	3.45	0.75	Required
20	Check selector handle linkage lever system	3.38	0.67	Required
21	Check neutral start switch and gear system	3.53	0.57	Required
22	Check engine idling speed	3.45	0.75	Required
23	Check tire pressure	3.65	0.58	Required
24	Check engine internal status	3.57	0.69	Required
25	Carry out manual shift test	3.53	0.57	Required
26	Carry out time delay test	3.34	0.88	Required
27	Carry out electronic control system diagnosis	3.38	0.67	Required
28	Carry out hydraulic test	3.30	0.79	Required
29	Carry out road test	3.61	0.62	Required
30	Analyze and judge the cause and location of results	3.45	0.75	Required

The result presented in table 2 revealed that all the 15 items (items16- 30) had a mean range of 3.30 to 3.61. This indicated that the respondents agreed on all the 15 items as areas where automobile technicians require training in fault diagnosis and removal procedures on automobiles with electronic transmission system because their means were above the cut-off point of 2.50. The standard deviation of the items also ranged from 0.56 to 0.88. This showed that the respondents were close to one another in their responses.

Discussion

The data presented in Tables 1 and 2 provided answers to research questions 1 and 2 respectively. The findings as presented in Table 1 revealed that 15 training needs are required by automobile technicians in diagnosing and maintaining automobiles with electronic transmission system. This is in line with the submissions of Know Your Parts (2016) as he noted that diagnosing, troubleshooting and repairing of

automobiles with ETS require the knowledge of a scan tool, oscilloscope and a multi-meter among others. The finding of the study was also corroborated by Tim (2016) who emphasized the use of electrical tester as an important tool for detecting circuit resistivity. In the same vein, Gary (2015); Isaac (2015) substantiated the claims of the findings of this study as the duo emphasized the use of scan tools such as On-Board Diagnostic (OBD) I, II and III in troubleshooting automobiles with electronic transmission system.

Furthermore, the findings of the study as presented in Table 2 also revealed 15 areas of training required by automobile technicians in fault diagnosis and removal procedures on automobiles with electronic transmission system. The findings were corroborated by the positions of Kun, Xiping and Xiangyu (2018) on fault diagnosis and removal procedures on automobiles with electronic transmission system as they noted that confirmation of fault phenomenon, reading of fault code, and checking oil level and oil quality among

others are key areas in fault diagnosis and removal procedures on automobiles with electronic transmission system.

Conclusion

This study, heightened by various scholars' positions brought to fore training needs of automobile technicians in diagnosing and maintaining automobiles with electronic transmission system. The researchers have reiterated automobile owners and drivers concern and proffered deemed solutions in areas of training. Therefore, acquiring training and retraining in the areas highlighted by the findings of this study remains a sine qua non to effective and efficient automobile diagnosis and maintenance in this part of the globe.

Recommendations

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

1. Automobile technicians should be trained on the use of relevant tools and equipment such as scan tools, oscilloscopes and multi-meters among others.
2. Automobile technicians should be trained in important areas of fault diagnosis and removal procedure.

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