NEW CONTENTS IN AUTOMOBILE TRANSMISSION, BRAKING, STEERING AND SUSPENSION SYSTEM FOR INCLUSION IN THE MINIMUM STANDARDS FOR NIGERIA CERTIFICATE IN EDUCATION IN AUTOMOBILE TECHNOLOGY

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Abstract
This study determined new contents in automobile transmission, braking, steering and suspension system for inclusion in the minimum standards for Nigeria Certificate in Education in automobile technology. The study adopted cross sectional survey research design in which data was collected with a 49 items questionnaire from population of 602 respondents comprising of automobile industrial supervisors and automobile technology lecturer's in the six geopolitical zones in Nigeria. The questionnaire was validated, pilot tested in Kogi State and reliability coefficient found to be 0.83 using Cronbach Alpha reliability statistics. Mean and standard deviation were used to answer the research questions while the t-test statistics was used to test the null hypotheses at 0.05 level of significance. Findings of the study revealed among others that, the new theory content, practical content as well as new tools and equipment necessary for inclusion are :scientific principle of operation and constructional details of automatic transmission, braking, steering and suspension system, demonstration of how to use computer scan tools to troubleshoot automatic transmission, braking, steering and suspension system as well as modern computerized tools and equipment. It was recommended among others that the National Commission for Colleges of Education and other industrial stakeholders should strengthen the NCE Automobile Technology minimum standard document by including new theory content, practical content as well as new tools and equipment necessary in the area of automobile transmission and braking system.

Keywords: Automobile, transmission system, braking system, Nigeria certificate in education.

Introduction

The Nigeria Certificate in Education (NCE, Technical) is a professional technical teacher's certificate awarded by Colleges of Education and other higher institutions offering NCE Technical programme. It's the minimum certificate that qualifies one to teach technical subjects at Basic Education level in Nigeria. According to the Federal Republic of Nigeria (FRN, 2013), the objective of the NCE (Technical) programme is to provide technical teachers with the intellectual and professional background adequate for teaching technical subjects at the basic education level as well as be self employed. The NCE Technical areas of specializations include Electrical/Electronic Technology, Wood work Technology, Metal Work Technology, Building Technology and Automobile Technology among others.

Automobile Technology as one of such areas involves the application of scientific knowledge in the design, selection of materials, construction, operation and maintenance of the automobile. Automobile is referred to as a self-propelled, trackless, non-articulated, four-wheeled land vehicle which include passenger cars, recreational vehicles, taxiçs and buses used to transport people and goods from one place to another, (Gartman, 2004). The objective of NCE (Technical) programme in automobile technology is to prepare students to become automobile repair professionals and teach technical subject in schools for example automobile technology.The NCE (Technical) in automobile technology is organized into; General Education, Trade Courses, Trade Related Courses/professional and Students Industrial work Experience Scheme (SIWES). The courses in the Minimum Standards for NCE the Automobile Technology include Introduction to automobile technology, brake system, engine repair, electrical system, heating and cooling system and transmission system. While, Student Industrial Work Experience Scheme (SIWES) is to provide students industrial experience, operation and the use of machinery, knowledge of the management structures of industrial organization and to develop good work habit.

To facilitate the attainment of the objective and ensure uniformity in implementation of programme minimum standards were set by the National Commission for Colleges Education (NCCE). The Minimum Standards for teacher educators define the minimum the educators should know and be able to do as well as their expected minimum dispositions towards their work, if they are to remain in their career (NCCE,

2012). The Nigeria Certificate in Education Minimum Standards contains the curriculum implementation guidelines for achieving the objectives of NCE Technical in automobile technology programme. Minimum standards are the totality of all the learning experiences provided to a learner under the auspices of the school. The Minimum standards consist of contents in various subjects. Minimum standards content refers to what is taught in school, it is the subject matter or topics consisting facts, concepts, ideas, knowledge within a particular subject and how they will bring about change in the individual and to the society (Urevbu, 1994).

The Minimum standards play a very important role in the technological development of automobile vehicles and a number of technological developments on these systems have been made to optimize their performances. For example, the transmission system and braking system of the motor vehicle has witnessed some technological developments in recent years. Automobile transmission system transmits power developed by the engine of automobile to the engine to the driving wheels called that transmission system. It is composed of clutch, the gearbox, propeller shaft, universal joints, rear axle, wheel and tyre.

Automobile braking, steering and suspension system is also a major safety component of any vehicle. If something is going wrong with one of them it can seriously affect the performance and safety of the car. Brakes are available as drums, older vehicles tend to have, while, and new models incorporate disc brake. Both systems used friction and resistance to bring the vehicle to a stop. Steering system takes the rotation of the steering wheel and converts into the swiveling motion of the wheels. The job of the suspension system is to maximize the friction between the tyres and the road, as well as provide stability to the steering system. There are number of different suspension systems. The main components of the suspension system are structs, shock absorbers, springs and tyres.

Gold (2015) highlighted that one of the recent development in the automobile transmission is the introduction of a Continuously Variable Transmission (CVT) type of automatic transmission which provides more useable power, better fuel economy and a smoother driving experience than traditional automatic transmission. Gold further explained that unlike the traditional automatic transmission, the CVT can vary the engine speed as needed to access maximum power as well as maximum fuel efficiency. Other automobile systems that have had some technological development in recent years are braking, steering and suspension systems.

Automobile brakes are energy conversion devices, which convert the kinetic energy of the vehicle into thermal energy. Since2014, brakes have changed greatly in design. Today, most vehicles use Electronic Brake Force Distribution (EBFD). EBFD according to Kerr (2014) is a computer-controlled solenoid that is part of the Antilock Brake System (ABS) which varies brake pressure to the rear wheels based on vehicle deceleration rates, steering angle and possibly even lateral acceleration of the vehicle. Similarly, the hydraulic operated steering system widely used in motor vehicles is gradually becoming obsolete as new systems such as the electro-hydraulic power steering systems are been introduced in modern vehicles.

The suspension system also had some improvements. The suspension system in the automobile cushions the effect of shocks and vibration transmitted from uneven road surfaces to the vehicle and passengers (Hyniova, 2013). New types of the shock absorber that utilize Magneto Rheological (MR) and Electro Rheological (ER) fluid are being developed is being applied in motor vehicles (Liu, 2008). Liu further stated that the application of MR and ER fluids allows the shock absorber to be continuously controlled thereby apparently enhancing its performance.

The increasing number of new sub-systems and system components in an automobile has made its maintenance a more complex task, although some of these systems make it easier to service (Nice, 2001). Since the job of NCE Automobile Technology graduates is to carry out maintenance of automobile vehicles and teach same in schools, therefore, it is necessary for such graduates to be well equipped with adequate knowledge of the new components and sub-systems, its functions, principles of operation and interrelationships. One of the most important sources of the service personnel are the graduates of Colleges of Education (Technical) and other related higher technological institutions.

These categories of individuals are not only expected to be able to efficiently and effectively service these vehicles after graduation but also participate in the training of younger automobile craftsmen at National

Trade Certificate (NTC) and Advanced National Trade Certificate (ANTC) levels. The degree of success in meeting this demand does not depend only on the number of skilled service personnel they can turn out. It depends more on the depth of skills and the degree of their relevance to the prevailing situations. The depth and degree of relevance of the skills invariably depend on the Minimum Standards used for the programmes. But the effects of new technological developments on a planned minimum standard document cannot be over-emphasized as new developments bring about changes in diagnosis and repairs. Some old tools, equipment, procedures and skills also become obsolete and invalid.

The new contents arising from technological developments when incorporated will ensure that graduates acquire skills and knowledge relevant to the work environment thereby enabling the employability of graduates. It is on this basis that the curricular for Technical Vocational Education and Training is subject to review every five years. An understanding of the characteristics and principles of operations of the new model of automobile vehicles and devices will be so critical to the automobile students in Colleges of Education (Technical), if they must be effective upon graduation.

Unfortunately, Abdulwahab (2004) and Haruna (2012) stated that the products of this programme can neither carry out effective maintenance of modern automobiles nor have the required abilities for effective instruction at the appropriate levels. Recognizing the fact that there are advancement in automobile technology and with the consequent increase in the rate of importation of different models of automobile vehicles and the present NCE Automobile Technology Minimum Standards which was last reviewed in 2012, the researchers felt that it was highly imperative to investigate new contents emerging from the developments for inclusion in the Minimum Standards document.

Statement of the Problem

A lot of technological developments in the transmission, braking, steering and suspension systemsis emerging on a daily basis which creates the need for identification of new contents for inclusion in order to produce graduates who are competent and relevant in today's work environment. The revised, 2012 edition of the Minimum Standards, which is presently in use, do not adequately address the new technological developments as well as new knowledge, skills, tools and equipment needed for studying and working on modern day automobiles (NACN,2015). This therefore has created a gap in the trade theory and practice components of the Minimum Standards as well as the tools and equipment needed in the study of the new technological developments in automobiles. The implication of this to the education of the NCE automobile graduates is that the skills acquired may not be relevant to the work environment and this has the effect of increasing employment in Nigeria.

As a measure to keep education and training in tune with the knowledge and skills needed in the world of work therefore, the Minimum Standards for Automobile Technology Education Programme at NCE level must be reviewed, enriched and updated every five years (UNESCO, 1990); this will enhance quality assurance and address observed shortcomings which could be subject of public criticisms. Hence, the concern of the present investigation, stated in form of a question is: what are the new contents in automobile transmission and braking system for inclusion in the minimum standards for NCE in automobile technology programme in Nigeria in order to increase the employability of the graduates?

Research Questions

The following research questions were formulated to guide the study:

1. What are the new contents in automobile transmission systems necessary for inclusion in NCE (Technical) Minimum Standards?
2. What are the new contents in automobile braking, steering and suspension systems necessary for inclusion in NCE (Technical) Minimum Standards?

Research Hypotheses

The following null hypotheses were tested at .05 level of significance:

$H0_1$: There is no significant difference in the mean ratings of Automobile Industrial Supervisors and Automobile Technology Lecturers on the new contents for inclusion in automobile transmission system.

$H0_2$: There is no significant difference in the mean ratings of Automobile Industrial Supervisors and Automobile Technology Lecturers on the new contents for inclusion in automobile braking, steering and suspension system.

Methodology

The study adopted cross sectional survey research design to investigate the new contents in automobile transmission and braking, steering and suspension system for inclusion in the minimum standards for Nigeria certificate in education in automobile technology. Cross sectional survey research design was considered most suitable for this study because it is designed to find out the opinion of the people toward an issue that is of interest to the generality of the populace using questionnaires (Uzoagulu, 2011).Data was collected through a 49 items questionnaire on entire population of 602 respondents comprising of automobile industrial supervisors and automobile technology lecturers in the six geopolitical zones in Nigeria. Since the population was manageable, there was no sampling. The questionnaire was validated by three senior lecturers, pilot tested in Kogi State and reliability coefficient found to be 0.83 using Cronbach Alpha reliability statistics. Mean and standard deviation were used to answer the research questions while the t-test statistics was used to test the null 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 4-point scale used {EI=Extremely Important (3.50-.4.00), VI= Very Important (2.50-.3.49), JI=Just Important (1.50-.2.49), NI=Not Important (0.50-.1.49}.

Results

Research Question One

What are the new contents in automobile transmission systems necessary for inclusion in NCE (Technical) Minimum Standards?

Result that answered this research question are presented in Table 1.

Table 1:

Mean Responses and Standard Deviation of the Automobile Industrial Supervisors and Automobile Technology Lecturers on the New Contents in Automobile Transmission System Necessary for Inclusion in NCE (Technical) Minimum Standards.

N1=471,1 N2=131.

S/N	Theory Conten	$\bar{x}_1$	$\bar{x}_2$	$\bar{x}_A$	SD_1	SD_2	SD_A	Decision
1	Principles of operation of Electro -Hydraulic Power Steering System (EHPSS)	3.89	3.58	3.73	.39	.51	.45	E I
2	Principles of operation of Dual -Clutch Transmission (DTC)	3.60	3.81	3.71	.54	.42	.48	E I
3	Exploded drawing of Continuously Variable Transmission (CVT)	3.50	3.79	3.64	.50	.41	.45	E I
4	Constructional details of Transaxle transmission	3.90	3.92	3.91	.37	.34	.35	E I
5	Knowledge of Autoactive(computer controlled)automatic transmission	3.88	3.94	3.91	.33	.23	.28	E I
6	Identification of parts of Infinitely Variable Transmission (IVT)	3.80	3.94	3.87	.40	.24	.32	E I
7	Sequence of operation of Electric Variable Transmission (EVT)	3.48	3.79	3.63	.50	.41	.46	E I
8	Constructional details of Automatic Transmission	3.82	3.86	3.84	.44	.43	.44	E I
9	Functionality details of Flappy Paddle or Paddle Shift Gearbox	3.94	3.98	3.96	.30	.18	.24	E I
10	Scientific explanation of Variable Pulley Transmission system	3.69	3.82	3.76	.52	.46	.49	E I
11	Exploded drawings of Hydrokinetic Torque Converter	3.63	3.82	3.72	.49	.38	.43	E I
12	Sequence of operation of Automated Manual Transmission	3.92	3.77	3.85	.34	.45	.39	E I
	New Practical Content							
13	Demonstrate how to connect the scan tool to vehicle	3.87	3.94	3.91	.44	.28	.36	E I
14	Take readings of the data displayed by the scan tool	3.89	3.89	3.89	.40	.43	.42	E I
15	Show how to drive the vehicle and check diagnosis trouble codes	3.82	3.88	3.85	.49	.43	.46	E I
16	Demonstrate how to interpret data readings on scan tool	3.81	3.58	3.70	.39	.49	.44	E I
17	Demonstrate the capacity to read fault codes	3.86	3.94	3.90	.39	.25	.32	E I
18	Exhibit diagnostic skills on vehicle	3.86	3.93	3.90	.39	.30	.34	E I
19	Observe safety rules in automobile workshop	1.29	1.19	1.24	.11	.14	.13	N I
	New Tools and Equipment							
20	Modern Automobile Vehicle	4.00	4.00	4.00	.00	.00	.00	E I
21	Computerized scan tools	3.76	3.76	3.76	.13	.15	.14	E I
22	Complete tool box	1.37	1.21	1.29	.21	.14	.17	N I

Key: N1=Number of Automobile Industrial Supervisors (AIS), N2=Number of Automobile Technology Lecturers (ATT), $\bar{x}_1$=Mean of AIS, $\bar{x}_2$=mean of ATT, $\bar{x}_A$=Grand mean of both groups of respondents, SD_1=Standard Deviation of AIS, SD_2=Standard Deviation of ATT, SD_A=Average Standard Deviation of AIS and ATT.EI=Extremely Important.

Table 1 revealed that all the 12 items were considered by the respondents as Extremely Important new theory contents in automobile transmission system. The grand mean rating of the items ranged from 3.63-3.96. This implies that the all items presented are extremely important new theory contents in automobile transmission system necessary for inclusion in NCE (Technical) Minimum Standards. Table 1 also revealed that 6 out of the 7 items with grand mean rating ranging between 3.70-3.91 were adjudged by the respondents as new practical contents in diagnosing modern transmission problem necessary for inclusion in NCE (Technical) Minimum Standards. However, item 19 with a grand mean rating of 1.24 was adjudged as not important for inclusion in NCE (Technical) Minimum Standards document. This rating of item 19 could be due to the fact that the existing NCE (Technical) Minimum Standards document already has practical content concerning observation of safety rules in automobile workshop. Table 1 similarly revealed that item 20 and 21 with grand mean rating ranging between 3.76-4.00 are adjudged by the respondents as Extremely Important new tools/equipment needed for diagnosing modern transmission problem while item22 with a grand mean rating of 1.29 was considered not important for inclusion in the NCE (Technical) Minimum Standards. This rating of item 22 could be due to the fact that the existing NCE (Technical) Minimum Standards document already has complete tool box as part of the basic tools provided in automobile workshop. The standard deviation of the items ranged from 0.00-0.49. This implies that the respondents were not far from one another in their responses. Item 20 with standard deviation of 0.00 implies that all the respondents unanimously agree that modern automobile vehicle is an extremely important item for practical purposes needed for inclusion in the NCE (Technical) Minimum Standards document.

Research Question Two

What are the new contents in braking, steering and suspension systems necessary for inclusion in NCE (Technical) Minimum Standards?

Result that answered this research question are presented in Tables 2.

Table 2:

Mean Responses and Standard Deviation of the Automobile Industrial Supervisors and Automobile Technology Lecturer on the New Contents in Automobile in Braking, Steering and Suspension System Necessary for Inclusion in NCE (Technical) Minimum Standards.

N1=471, N2=131.

S/N	Item	s	$\bar{x}_1$	$\bar{x}_2$	$\bar{x}$	SD_1	SD_2	SD_3	Decision
1	Principles of operation of Antilock Braking System (ABS) with electronic Brake force Distribution (EBD)		3.81	3.58	3.70	.39	.51	.45	E I
2	Method of Electromagnetic Braking System		3.86	3.81	3.84	.39	.42	.40	E I
3	Brake by Wire Technology		3.86	3.79	3.83	.39	.41	.40	E I
4	Operational sequence of Integrated Brake Control Unit (IBC)		3.86	3.92	3.89	.37	.34	.35	E I
5	Science behind Electronic Stability Control (ESC)		3.56	3.94	3.75	.50	.23	.36	E I
6	Knowledge of Electronic Stability and Traction Control system		3.82	3.94	3.88	.11	.24	.17	E I
7	Reasons for Automatic Emergency Braking (AEB)		3.80	3.79	3.79	.50	.41	.46	E I
8	Method of Traction Control Systems		3.55	3.86	3.70	.50	.43	.46	E I
9	Constructional details of Electro-Hydraulic Power Steering System		3.67	3.98	3.82	.13	.18	.15	E I
10	Exploded drawings of Electric Assisted Power Steering		3.69	3.82	3.75	.21	.46	.33	E I
11	Operational sequence of Column Assist Type steering		3.56	3.82	3.69	.58	.38	.48	E I
	New Practical Content								
12	Demonstrate how to open the hood		1.14	1.33	1.24	.13	.42	.27	N I
13	Illustrate practical ability to locate the hydraulic controlled system unit		3.94	3.42	3.68	.35	.52	.43	E I
14	Dismantling is this skills in the removal of the hydraulic controlled system unit		3.91	3.98	3.95	.11	.18	.15	E I
15	How to correctly replace the hydraulic controlled system unit		3.82	3.84	3.83	.11	.01	.06	E I
16	Display skills in upgrading special wiring harness for the ground wire		3.96	3.79	3.87	.19	.41	.30	E I
17	Carry out upgrading of hydraulic hose to correct the system		3.92	3.41	3.67	.38	.53	.46	E I
18	Show how to change the brake fluid		1.49	1.12	1.31	.13	.12	.12	N I
19	Illustrate competency in bleeding the system		3.67	3.97	3.82	.13	.26	.19	E I
20	Demonstrate how to flush the system		3.78	3.62	3.70	.22	.50	.36	E I
21	Practical competence to record and adapt the data		3.81	3.64	3.72	.11	.48	.30	E I
22	Exhibit how to re -programme the automatic steering system		3.79	3.92	3.86	.22	.38	.30	E I
	New Tools and Equipment								
23	Modern Automobile Vehicle		4.00	4.00	4.00	.00	.00	.00	E I
24	Complete tool box		1.11	1.20	1.16	.11	.22	.17	N I
25	Hydraulic hose		.99	1.23	1.11	.13	.12	.13	N I
26	Assorted spanners		1.19	1.16	1.18	.13	.12	.13	N I
27	Brake fluid		.00	1.07	1.07	.01	.09	.05	N I

Table 2 revealed that all the items were considered by the two groups of respondents as extremely important new theory contents in automobile braking, steering and suspension system. Table 2 also revealed that the items with grand mean rating between 3.61-3.95 are considered as extremely important while item 32 and 38 with grand mean rating between 1.24-1.31 are considered as not important. The rating of item 32 and 38 could be due to the fact that the existing NCE (Technical) Minimum Standards have already captured these items. Table 2also revealed that item 24, 25, 26 and 27 with grand mean rating ranging between 1.07-1.18 are adjudged by the respondents as not important while item 23 with grand mean rating of 4.00 is considered as extremely important. The rating of item 24, 25, 26 and 27 could be due to the fact that the existing NCE (Technical) Minimum Standards have already captured these items as part of basic tools provided in automobile workshops. The standard deviation of the items ranged from 0.00-0.51. This implies that the respondents were not far from one another in their responses.

Hypotheses Testing

HO1: There is no significant difference in the mean ratings of Automobile Industrial Supervisors and Automobile Technology Lecturers on new contents for inclusion in automobile transmission system.

Table 3: t-test Analysis of the Mean Ratings of Automobile Industrial Supervisors and Automobile Technology Lecturers on New contents for Inclusion in Automobile Transmission System.

Grou	p	N	$\bar{x}$	SD	*df*	t-value	p - value Sig. (2-tailed)	, Alpha Level	Decision
AI	S	47	13.76	0.22	60	0.049	0.961	0.05	Accepted
AT	T	13	13.77	0.19					

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

From Table 3 revealed that since the p-value, Sig. (2-tailed) (0.961) is greater than 0.05, it implies that there is no significant difference in the mean responses of both group of respondents. Therefore the null hypothesis one was accepted.

HO2: There is no significant difference in the mean ratings of Automobile Industrial Supervisors and Automobile Technology Lecturers on new contents for inclusion in automobile braking, steering and suspension system.

Table 4: t-test Analysis of the Mean Ratings of Automobile Industrial Supervisors and Automobile Technology Lecturers on New Contents for Inclusion in Automobile Breaking, Steering and Suspension System.

Grou	p	N	$\bar{x}$	SD	*df*	t-value	p - value Sig. (2-tailed)	,Alpha Level	Decision
AI	S	47	13.77	0.18	60	0.331	0.741	0.05	Accepted
AT	T	13	13.79	0.17					

Table 4 since the p-value, Sig. (2-tailed) (0.741) is greater than 0.05, it is an indication that there is no significant difference in the mean responses of the two group of respondents. Thus the null hypothesis was upheld.

Summary of Major Findings of the Study

1. The new contents in automobile transmission systems necessary for inclusion in NCE (Technical) Minimum Standards includes: new theoretical content concerning the principles of operation of modern automobile electrical, electronics and computerized systems and sub systems in the automobile transmission system ; practical content in diagnosing modern transmission problem, automatic transmission tear down inspection on work bench as well as the modern tools and equipment for carrying out the practical tasks on modern automobile transmission systems.
2. The new contents in automobile braking, steering and suspension system necessary for inclusion in NCE (Technical) Minimum Standards includes: new theoretical content concerning the principles of operation of modern automobile electrical, electronics and computerized systems

and sub systems in the automobile breaking, steering and suspension system; practical content in servotronic brake control replacement, troubleshooting power steering pump problems, as well as the modern tools and equipment for carrying out the practical tasks on modern automobile breaking, steering and suspension system.

3. There is no significant difference in the mean responses of Automobile Industrial Supervisors and Automobile Technology Lecturers on the new contents for inclusion in automobile transmission system.

4. There is no significant difference in the mean responses of Automobile Industrial Supervisors and Automobile Technology Lecturers on the new contents for inclusion in automobile braking, steering and suspension system.

Discussion of Findings

The results presented in Tables 1 provided answers to research question one. These emerging new contents in automobile transmission systems required for effective maintenance and repairs of modern automobiles could be attributed to the dynamic nature of the automobile industries and automobile products which have recently become dominated with electronics and computer technologies brought about by technological innovations automobile industries. This is related to the findings of Odigiri and Ogwo (2013) who in a study on integration of new technological innovations into the automobile curriculum for Nigerian technical college programmes found out that the innovative developments in automobile body structure, components and systems have drastically changed the maintenance activities in the automobile workplace as a lot of electro-mechanical skills is now required for effective maintenance of modern automobiles. The finding is in line with the findings of Ogwo (2004) who in a research study on informal sector technical skills development experiences in the maintenance of modern automobiles in Nigeria found out that the increasing use of electronics in modern vehicles requires the modern vehicle mechanic to be able to use diagnostic scan tools, and varieties of maintenance equipment and machines in carrying out maintenance and repairs of each system, sub-system and units accurately.

Similarly Roberson (2013), in a study on automatic transmission system in modern vehicles revealed that the automatic transmission mechanism facilitates gear changing by dispensing with the need to press a clutch pedal at the same time as changing gears. It uses electronic sensors, pneumatics, processors and actuators to execute gear shifts on input from the driver or by a computer. This removes the need for a clutch pedal which the driver otherwise needs to depress before making a gear change, since the clutch itself is actuated by electronic equipment which can synchronize the timing and torque required to make quick, smooth gear shifts. The t-test statistics on the first null hypothesis revealed that there is no significant difference in the mean responses of Automobile Industrial Supervisors and Automobile Technology Lecturers on the new contents for inclusion in automobile transmission system. Therefore the null hypothesis one was accepted.

The results presented in Table 2 provided answers to research question two. The need to include modern automobile electrical, electronics and computerized systems and sub-systems in the automobile braking, steering and suspension system in the NCE (Technical) Minimum Standards document could be attributed to the continuous use of electrical, electronics and computerized controls in most automobile breaking, steering and suspension system. To buttress this, Kerr (2012) revealed that Anti-lock Braking System (ABS), originally developed for aircraft braking system is now been applied in modern motor vehicles. Ofria, (2015) reported that when the ABS detects that one or more wheels have stopped or are turning much slower than the remaining wheels, the computer sends a signal to momentarily remove and reapply or pulse the pressure to the affected wheels to allow them to continue turning. With ABS, no matter how hard the pedal is pressed, each wheel is prevented from locking. The ABS prevents skidding and allows the driver to steer while panic-braking.

In support of this, Kerr (2014) in a study on modern baking system revealed that most vehicles today use Electronic Brake Force Distribution (EBFD). Kerr also maintained that EBFD is a computer-controlled solenoid that is part of the antilock brake system that varies brake pressure to the rear wheels based on vehicle deceleration rates, steering angle and possibly even lateral acceleration of the vehicle. The respondent's acceptance that all the items are extremely important new theory contents for inclusion in automobile steering was supported by Zatz (2015) who revealed that a recent innovation in steering

system used on modern vehicle is the Electrically Assisted Steering (EAS). The EAS is a power-assist system that eliminates the connection between the engine and steering system. Zatz (2015) in a study on innovation in steering system revealed that EAS takes the technology a step further by completely eliminating hydraulic fluid and the accompanying hardware from the system, becoming a full "Electronic Power Steering System" or EPS.

Justifying the respondents opinion for inclusion of new theory content in automobile suspension system, Servason (2014) in a study on suspension system technologies, revealed that the most popular suspensions systems for passenger cars today are the double wishbone suspension system and the MacPherson's strut suspension system. Servason maintained that while it is more usual to see the double wishbone system at the rear end of the car, Macpherson's strut suspension system normally finds its place at the front end of the car. However, in light duty trailers Christene and Gable (2015) reported that an innovated air ride suspension system is gaining popularity. The second null hypothesis revealed that there is nosignificant difference in the mean responses ofAutomobile Industrial Supervisors and Automobile Technology Lecturers on new contents for inclusion in automobile braking, steering and suspension system. Thus the null hypothesis was upheld.

Conclusion

Based on the findings of the study and the discussion it was concluded that there is the need to include the new contents in automobile transmission systems as well as braking systems in the NCE (Technical) Minimum Standards document to enhance effective training and performance by both automobile teachers and automobile technology students. Furthermore, it is concluded that understanding of the theoretical operational principle of the scan tools as well been able to use the scan tools helps the automobile mechanic to effectively carry out correct diagnosis of faults in modern vehicles. Based on the conclusion the study has some far reaching educational implication. The study revealed that the new contents to be included in the NCE (Technical) Automobile Technology Minimum Standards for the purpose of updating and making it more relevant to the world of work were all rated very high and as extremely highly important. This means that the lecturers of the programme should not spend all the contact hours teaching only practical skills but theoretical should be incorporated.

Recommendations

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

1. The NCCE as well as other industrial stakeholders should strengthen the NCE Automobile Technology minimum standard document by including the identified new theory contents, practical contents as well as new tools and equipment necessary in the area of automobile transmission systems as well as braking, steering and suspension system.
2. The NCCE should periodically give detail orientation to automobile technology lecturers and students on the need to adapt to the changes in teaching and learning method that the inclusion of the new theory and practical content may bring.
3. Colleges of Education and other higher institutions offering NCE (Technical) should strengthen the Minimum Standards implementation process by including lecturers and student activities that focuses on the new theory and practical content to enhance teaching and learning.
4. The management of NCE (Technical) awarding institutions in Nigeria should organize capacity building workshop for their teachers to strengthen their capacities in the effective instructional delivery of the new theory and practical content in the area of automobile transmission systems as well as braking, steering and suspension system.
5. Adequate training facilities and instructional materials should be made available in Colleges of Education and other higher institutions offering NCE (Technical) to enhance effective teaching and learning of the new theory and practical content in the area of automobile transmission systems as well as braking, steering and suspension system.

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