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New Contents In Automobile Fueling And Air Conditioning 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 fueling and air conditioning system for inclusion in the minimum standards for Nigeria certificate in education in automobile technology. The study adopted cross sectional survey design in which data was collected with a 38 items questionnaire from population of 602 respondents comprising of automobile industrial supervisors and automobile technology lecturers 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 principles of operation and constructional details of automobile fueling and air conditioning system in modern vehicle ; practical content in fixing a broken modern air conditioner system in modern vehicle, replacement of a fuel injector as well as the modern tools and equipment for carrying out the practical tasks in the modern automobile fuel and air conditioning system. 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 fueling system, air conditioning system.*

Keywords: *Automobile, fueling system, air conditioning system, Nigeria certificate in education.*

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I. Introduction

Technological developments in the automobile have improved auto fuel and air conditioning systems.

For most of the automobile engines, the carburetor has been the device that supplied fuel to the engine. However, the fuel system used in modern cars has changed over the years. At first, carburetors were replaced with throttle body fuel injection systems (also known as single point **or** central fuel injection systems) that incorporated electrically controlled fuel-injector valves into the throttle body (Nice, 2015 a). According to Nice these were almost a bolt-in replacement for the carburetor, so the automakers didn't have to make any drastic changes to their engine designs. Gradually, as new engines were designed, throttle body fuel injection was replaced by multi-port fuel injection (also known as port**,** multi-point or sequential fuel injection). These systems have a fuel injector for each cylinder, usually positioned to spray right at the intake valve.

These systems provide more accurate fuel metering and quicker response. Improvements in automobile system performance have also been observed in automobile air conditioning systems. Air Conditioning in the automobile system is an arrangement for improving the comfort and health of individual in a vehicle by controlling the temperature, humidity and circulation of air. Since the advent of the automotive air conditioning system in the 1940's, many things have undergone extensive change. For example, an innovative air-conditioning system for vehicles that can turn scorching summer heat into cool air without a single drop of gasoline has been introduced and are been used in motor vehicles. Motorists are so used to turn on the engine for air-conditioning, however, according to Lai (2011) solar-powered air-conditioning system for vehicles (SAV) has broken this convention. Lai maintained that the new design featuring photovoltaic technology and intelligent power control, SAV switches on-board air-conditioner to solar power when petrol engine shuts off, and the switch-over is automatic and seamless. This is an indication that there are obvious innovative technological development in automobile technology.

Automobile Technology is a professional area of specialization that involves the application of scientific knowledge in the design, selection of materials, construction, operation and maintenance of the automobile. Gartman (2004) described an automobile as a self-propelled, trackless, non-articulated, four-

wheeled land vehicle which includes passenger cars, recreational vehicles, taxies and buses used to transport people and goods from one place to another. Automobile Technology is one of the technology education areas taught at the Nigeria Certificate in Education (NCE) Technical programmes in Nigeria. 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). According to (NCCE, 2012), the professional core 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 enhance 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). According to the Federal Republic of Nigeria (FRN) (2013), the Nigeria Certificate in Education Minimum Standards contains the curriculum implementation guidelines for achieving the objectives of NCE Technical in Automobile Technology programme. The minimum standards are like a curriculum package encompassing the totality of all the learning experiences and contents in various subjects designed to guide instructors and students towards attaining the objectives of a programme. Therefore, Minimum Standards are the totality of all the learning experiences provided to a learner under the auspices of the school.

The NCE Minimum Standards in Automobile Technology consist of objective, contents in the Engine, Transmission System, Braking System, Steering System, Suspension System, Fuel and Air conditioning system as well as Electrical System. 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 fuel and air conditioning system of the modern vehicle have witnessed numerous technological developments in recent years to improve human comfort. The automobile fueling and air conditioning system is directly linked to the engine for continual operation.

Modern engine uses that energy to make the wheels run. Air enters the engine through the air cleaner and proceeds to throttle plate. Hillier, Coombes and Rogers (2007) revealed that, currently the engine is dominated and controlled by automobile electrical and computer system. Automobile Electrical and Computer System has gradually evolved over the years and today it is usually called automobile electronics because it integrates electrical, electronics and automatic computer controls in modern automobiles. In the early days, automobile electrical system comprised of only the basic wiring technologies that were used for distributing power to other parts of a vehicle. It had only switches, wires, relays and controlled motors as its key component but today's electrical and computer system include sensors, actuators, alternators, battery, oxygen sensors, generator, starter solenoid, start drive, high power electrical system and other devices.

Automobile electrical system has gradually evolved over the years and today it assimilates automatic computer control of the automotive mechanics. In the early days, automobiles electrical system comprised of only basic wiring technologies that were used for distributing power to other parts of a vehicle. It had only switches, wires, relays and controlled motors as its key components but in today's electrical system computer chips regulate and monitor everything from ABS brakes, fuel injection, and oxygen sensors, to the latest in GPS navigation equipment, obstacle sensors, and state-of-the-art stereos.

In the past, electrical systems were basically stand-alone. For example, the ignition system was only responsible for supplying the voltage needed to fire the spark plugs. Ignition timing was controlled by vacuum and mechanical advance systems. Today there are very few electrical systems that are still independent (George, 2015). However, the introduction of computers in the electrical electronic systems of motor vehicles marked the dawn of a new technological era in the automobile industry.

The introduction of electronic controls (computers) has brought about greater changes in the operations of many systems in the motor vehicle. Nice (2001b) noted that the number of computer systems is increasing with every model year and there may be as many as 50 microprocessors in a modern car. Most manufactures today network their electrical systems together through computers. This means that information gathered by one system can be used by another. Shelest (2012) reported that throughout the car are various computers called electronic control units, or ECUs and that each ECU has several jobs: controlling the engine or transmission, rolling up windows, unlocking doors, and the like. The author maintained that these computers have sensors and switches wired in to detect variables such as temperature, pressure, and voltage, acceleration at different angles, braking, yaw and roll of the vehicle, steering angle, and many other signals. It the need to unveil the new content in automobile fueling and air conditioning system that necessitate this study. The researcher deems it

necessary to find out the new contents emerging from technological developments for inclusion in the Minimum Standards.

Statement of the Problem

The incorporation of new technologies into the automobile made the modern automobile an assemblage of a group of sophisticated technologies (Lipman,et al, 1998). The increasing number of 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, 2001b). Since the job 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 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. As clearly stated by the Federal Republic of Nigeria (FRN, 2012), the objective of the NCE (Technical) programme is to provide technical teachers with the intellectual and professional background adequate for teaching automobile technology subjects to craftsmen, and to make them adaptable to any changing situation in technological development not only in the country but in the world at large. 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.

To facilitate the attainment of this objective the Minimum Standards were introduced in 1990, and reviewed in 1998, 2003, 2008, and 2012 respectively. However, from 2012 to date a lot of Technological Developments in the Transmission, Braking, Steering and Suspension, Auto-Electrical and Computers, Automobile Engines, Fuel and Air Conditioning Systems have taken place 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 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 skill gap has lead to the deficiency in technical skills required by graduating NCE (Technical) students in Automobile Technology. It is the shortage in performance skills that girth to this study.

Research Questions

The following research question was formulated to guide the study:

I. What are the new contents in automobile fuelling and air conditioning system necessary for inclusion in NCE (Technical) Minimum Standards?

Research Hypotheses

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

H01: There is no significant difference in the mean ratings of Automobile Industrial Automobile Supervisors and Automobile Technology Lecturers on contents for inclusion in automobile fueling and air conditioning system.

II. Methodology

The study adopted cross sectional survey design to investigate the new contents in automobile fuelling and air conditioning 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 via a 38 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, 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}.

III. Results

Research Question One

What are the new contents in automobile fuelling and air conditioning system 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 fueling and air conditioning system necessary for inclusion in NCE (Technical) Minimum Standards.

N1=471,1 N2=131.

S/N	Theory Content	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_A$	SD_1	SD_2	SD_A	Decision
1	Principles of operation of Multi Point Fuel Injection (MPFI)	3.89	3.58	3.74	.01	.51	.26	EI
2	Operational details of Gasoline Direct Injection (GDI)	3.97	3.81	3.89	.17	.42	.29	EI
3	Sequence of operation of Electronic Ignition System	3.94	3.79	3.87	.35	.41	.38	EI
4	Science behind Electronic Fuel Injection (EFI)	3.86	3.92	3.89	.13	.34	.24	EI
5	Scientific principles guiding Electronic Carburetor	3.79	3.94	3.87	.12	.23	.17	EI
6	Principles of operating Dual fuel system	3.96	3.94	3.95	.19	.24	.21	EI
7	Functional details of Multi Point Fuel Injector	3.92	3.79	3.85	.38	.41	.40	EI
8	Knowledge of Simultaneous Injection	3.94	3.86	3.90	.35	.43	.39	EI
9	Methods of Single-point Electronic Petrol Injection System	3.78	3.98	3.88	.34	.18	.26	EI
10	Operational sequence of Electronically control Unit-injector Pump Diesel Fuel Injection System	3.91	3.82	3.86	.32	.46	.39	EI
11	Physics knowledge guiding Solar Powered Air Conditioning System for Vehicles (SAV)	3.78	3.82	3.80	.22	.38	.30	EI
12	Operations of Dual Zone Air Conditioning System	3.91	3.77	3.84	.42	.45	.43	EI
13	Heat exchange rate in Electronic Controlled Air-Conditioning System	3.74	3.94	3.84	.21	.28	.24	EI
14	Operation of Multi Zone Air Conditioning System	3.95	3.89	3.92	.21	.43	.32	EI
15	Temperature variations of Computer Automatic Temperature Control	3.63	3.88	3.76	.51	.43	.47	EI
16	Operational details of Air Conditioning Refrigerant recovery and Recycling System (ACR3)	3.68	3.58	3.63	.12	.49	.31	EI
17	Operations of Cycling Clutch Orifice Tube (CCOT) Type	3.89	3.94	3.92	.11	.25	.18	EI
18	Exploded drawings of Variable Displacement Orifice Tube (VDOT) Type	3.57	3.93	3.75	.50	.30	.40	EI
19	Details of operations of Cycling Clutch Thermostatic Expansion Valve (CCTXV) Type	2.96	3.91	3.44	.19	.36	.28	VI
20	Guiding rules of Variable Displacement Thermostatic Expansion Valve (VDTXV) Type	3.65	3.62	3.63	.48	.50	.49	EI
	New Practical Content							
21	Demonstrate ability to open the hood	1.23	.33	.78	.22	.02	.12	NI
22	Display competence in locating the lower pressure feeding side	3.35	3.73	3.54	.48	.49	.48	EI
23	Illustrate skills in inserting the gauge to the lower feeding side	3.35	3.79	3.57	.48	.41	.44	EI
24	Ability to check the reading on the gauge (if the reading is zero the refrigerant has leaked off)	3.35	3.41	3.38	.48	.55	.51	VI
25	Show skills in the use of ultraviolent leak dye	3.68	3.79	3.73	.11	.45	.28	EI
26	Demonstrate ability to add some refrigerant to the system	3.87	3.45	3.66	.41	.54	.47	EI
27	Illustrate practical ability to starts the engine for the compressor to run, circulate and sock in the refrigerant and the dyes for 2-15minutes	3.94	3.70	3.82	.30	.46	.38	EI
28	Ability to pour soapy water on top of the system	3.89	3.43	3.66	.11	.53	.32	EI
29	Display ability to check for bubbles and locate the leak.	3.66	3.42	3.54	.10	.54	.32	EI
30	Ability to diagnose faulty compressor	3.35	3.70	3.53	.48	.46	.47	EI
31	Demonstrate ability to dissemble systems and sub systems	3.62	3.76	3.69	.21	.11	.16	EI
32	Illustrate ability in assemble sub components into a whole	3.97	3.61	3.79	.17	.53	.35	EI
	New Tools and Equipment							
33	Modern Automobile Vehicle	4.00	4.00	4.00	.00	.00	.00	EI
34	Ac gauge	3.72	3.98	3.85	.13	.18	.16	EI
35	Refrigerant can	4.00	4.00	4.00	.00	.00	.00	EI
36	Ultraviolent leak dye	3.96	3.79	3.87	.19	.41	.30	EI
37	Ultraviolent light	3.92	3.41	3.67	.38	.53	.46	EI
38	Soapy water	3.94	3.94	3.94	.35	.33	.34	EI

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 ATL, $\bar{X}_A$=Grand mean of both groups of respondents, SD_1=Standard Deviation of AIS, SD_2=Standard Deviation of ATL, SD_A=Average Standard Deviation of AIS and ATL.

Table 1 revealed that while item 19 with grand mean rating of 3.44 was considered by the respondents as a very important item, all the other items with grand mean rating between 3.63-3.95 were considered as extremely important new theory contents for inclusion in automobile fuelling and air conditioning system. Table 1 also revealed that the items with grand mean rating between 3.54-3.82 are considered as extremely important practical content while item 24 with grand mean rating of 3.38 is adjudged as very important. Also item 21 with grand mean rating of 0.78 was considered not important. The rating of item 21 with grand mean rating of 0.78 could be due to the fact that the existing NCE (Technical) Minimum Standards have already captured this item. The result from the respondents responses contained in Table 1 further indicated that all the items presented under this sub heading were adjudged as extremely important with grand mean rating ranging between 3.67-4.00. The means that all the items are extremely important new tools/equipment needed for carrying out fixing of a brake down modern fueling and air conditioner system necessary for inclusion in NCE (Technical) Minimum Standards document. 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 to the items. Item 33 and 35 with standard deviation of 0.00 implies that all the respondents unanimously agree that the two items were extremely important practical content needed for inclusion in the NCE (Technical) Minimum Standards document.

Hypotheses Testing

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

Table 2: t-test analysis of the mean ratings of Automobile Industrial Supervisors and Automobile Technology Lecturers on new contents for inclusion in automobile fueling and air conditioning system.

Group	N	$\bar{X}$	SD	Df	t-value	p-value, Sig. (2-tailed)	Alpha Level	Decision
AIS	471	3.76	0.22	600	0.049	0.961	0.05	Accepted
ATT	131	3.77	0.19					

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

From Table 2 since the p-value, Sig. (2-tailed) (0.364) is greater than 0.05, it shows that there is no significant difference in the mean responses of both group of respondents. Thus the null hypothesis was accepted. Hence, 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 fueling and air conditioning system.

Summary of Major Findings of the Study

1. The new contents in automobile fueling and air conditioning system necessary for inclusion in NCE (Technical) Minimum Standards includes: new theoretical content concerning the principles of operation of electrical, electronics and computerized systems and sub systems in automobile fueling and air conditioning system in modern vehicle ; practical content in fixing a broken modern air conditioner system in modern vehicle, replacement of a fuel injector as well as the modern tools and equipment for carrying out the practical tasks in the modern automobile fuel and air conditioning system..
2. 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 fueling and air conditioning system.

IV. Discussion of Findings

The results presented in Table 1 provided answers to research question one. The findings revealed that the new contents in automobile fueling and air conditioning system necessary for inclusion in NCE (Technical) Minimum Standards includes: new theoretical content concerning the principles of operation of electrical, electronics and computerized systems and sub systems in automobile fueling and air conditioning system in modern vehicle ; practical content in fixing a broken modern air conditioner system in modern vehicle, replacement of a fuel injector as well as the modern tools and equipment for carrying out the practical tasks in the modern automobile fueling and air conditioning system.

Though some automobiles in Nigerian roads are still using the single point system, single-point injection was however, a stepping stone to more innovations in the fuel system such as the more complex multi-point system. Multi-point Fuel Injection (MPFI) setup is used by a vast number of automobiles in Nigeria today. Gupta, et al (2013) reported that in the multipoint injection system, There is one injector per cylinder; the injector supplies the fuel into the admission valve which admits the fuel and air into the cylinder. Gupta, et al

maintained that this system gives an individual control on this cylinder, improving the fuel consumption in relation of the single point injection.

The main advantage of this innovation according to Bruzek (2008) is that MPFI meters fuel more precisely than do TBI designs, better achieving the desired air/fuel ratio and improving all related aspects. Also, it virtually eliminates the possibility that fuel will condense or collect in the intake manifold. One of the most significant new trends in automobile air conditioning is the use of alternative refrigerants to replace the more usual R134a. Because of its contribution to the greenhouse effect, the long-term prospects for R134a, which has been used to the present time, are not very good (Robbins, 2014).

However, Robbins, 2014) reported that intensive research and development is underway into refrigeration systems using alternative refrigerants. Robbins (2014) maintained that CO2 is among the alternative refrigerants used for automobile air conditioning. In describing the operation of the new innovation Robbins (2014) stated that CO2 refrigeration system functions in air conditioning equipments right at the critical pressure of 7.38 MPA, or sometimes above it, also, heat transfer therefore takes place in many cases at an economic rate. The findings revealed that need to include the new theory as well as practical contents in automobile fueling and air conditioning system necessary for inclusion in NCE (Technical) Minimum Standards to effectively prepare automobile teachers and automobile technology graduates with relevant innovative knowledge and skills needed to function in the modern automobile industry. The 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 fueling and air conditioning system. Thus the null hypothesis was accepted.

The opinion of the respondents' that certain items presented to them were not important for inclusion in the in NCE (Technical) Minimum Standards could be due to the fact that the existing NCE (Technical) Minimum Standards document have already captured these items. This was supported by Federal Republic of Nigeria (FRN, 2012) which outlined a long list of automobile tools, equipment and consumable materials needed in automobile workshop before course accreditation in Colleges of Education in Nigeria. The automobile tools, equipment and consumable materials listed by (FRN, 2012) among others include: complete tool box, axle stand, hydraulic hose, assorted spanners, brake fluid, screw drivers, crane jack and ratchets.

The implication of the continuous innovations and utilization in automobile electrical, electronics and computerized systems means a change in automobile maintenance practices. Even new tools and equipment are being introduced to enhance fault diagnosis and repairs. As a result, the automobile workplace is now dominated with scan tools and varieties of diagnostic equipment and electronic machines that require special training for its handling and usage. Notably of all is the automobile scan tool, a device used to access on board diagnostic (OBD) information from the automotive computer memory (William & Donald, 2008). There are different sizes and shapes of scan tools. They revealed that, the two basic types of scan tools are the "stand alone" scan tool or hand-held scan tool which do not require a computer and the "personal computer" (PC) based scan tools which requires a computer for its operation.

The scan tool assists the modern automobile mechanic in repairing the automobile by providing access to the vehicle sensor readings. According to Peter (2009) the scan tool helps the modern auto mechanic to read Diagnostic Trouble Code (DTC) reported by the Electronic Control Unit (ECU). DTC is a combination of alphabet and numbers which the ECU displays when there is a fault in the vehicle. The scan tool displays in real time, the value measured by any sensor. For instance, the DTC PO503 means (vehicle speed sensor intermittent). Understanding the theoretical operational principle of the scan tools as well being able to use the scan tools helps the automobile mechanic to effectively carry out correct diagnosis of faults in modern vehicles.

IV .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 fueling and air conditioning system in the NCE (Technical) Minimum Standards document to enhance effective training and performance by both automobile lecturers and automobile technology students. It was also deduced that the 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 the automobile fueling and air conditioning system of modern vehicles. It implies that the automobile lecturers currently have a tedious tasks of teaching in details to expose students to the new theory content, new practical content as well as new tools and equipment needed for effective performance in the maintenance and repair of automobile fueling and air conditioning system. It also demand new learning resources or new textbooks and practical tools, equipment plus other training facilities needed to enhance professional practice in automobile maintenance and repairs.

V. Recommendations

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

1. 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 fueling and air conditioning 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 in automobile fueling and air conditioning system..
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 of automobile fueling and air conditioning system.
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 automobile fueling and air conditioning 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 automobile fueling and air conditioning system.

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