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Capacity Building Needs of Lecturers in Modern Automotive Technologies for Teaching Automobile Technology in Colleges of Education (Tech) in Nigeria

Mohammed Abdullahi Shehu[1], Saidu Isa Mohammed[1], Musa Usman Iliya[2]

[1]Department of Automobile Technology, Federal College of Education (Technical) Bichi, Bichi, Nigeria

[2]Department of Automobile Technology, Federal College of Education (Technical) Gombe, Gombe, Nigeria

Email address:

muhd08122@gmail.com (Mohammed Abdullahi Shehu), saidumohammad32@gmail.com (Saidu Isa Mohammed), iliyamusagelengu@gmail.com (Musa Usman Iliya)

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Abstract: The survey research design method was adopted for the study. The population for the study was 45, which comprises 25 lecturers of Automotive Technologies in Colleges of Education and 20 Industrial Workers of Automobile in Northern, Nigeria. There was no sampling because the population was of manageable size. A questionnaire consisting 71 items was developed and used for data collection. The questionnaire was face validated by two lecturers from Department of Automobile Technology, Federal College of Education (Tech) Bichi, Kano State and one from Department of Automobile Technology, Federal College of Education (Tech) Gombe State. Cronbach alpha reliability method was used in determining the internal consistency of the instrument. A reliability coefficient of 0.81 was obtained. Forty five copies of questionnaire were administered to the respondent with help of two research assistants. 40 copies of the questionnaire were retrieved and analyzed using the mean and improvement needed index to answer research questions. T-test statistic was employed to test the null hypotheses at 0.05 level of significant. Based on the findings of the study, the following recommendations are made: Workshop and seminars should be organized for lecturers of automotive technology on modern automotive engine system, transmission system, automotive electrical system (Autotronics) and use of modern diagnostic equipment in order to build their capacity and Lecturers of automotive technology in Colleges of Education (Technical) should be also sent for further training in the Universities in order to acquire more knowledge in their area of specialization.

Keywords: Colleges of Education (Tech), Capacity Building Needs, Automotive Technologies, Automobile Technology, Lecturers

1. Introduction

Technical and vocational education is undoubtedly a very important aspect of the Nigerian educational system under the 9-3-4 programme. It develops occupational competence and teaches those skills which enable an individual to earn a living [10]. Technical and vocational education as that aspect of education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge [5]. Technical and vocational education therefore is a form of training which has been designed technically and systematically to accommodate both the trainer and the trainee, especially the trainee to acquire the basic knowledge, skill and attitudes needed for efficient performance in chosen occupational carrier for self-reliance. Technical and Vocational education programmes are obtained in various vocational and technical institutions. There are five types of Technical and Vocational Training Institutions outlined in the National Policy on Education, They are: Vocational schools, Technical Colleges, Colleges of Education (Technical), Polytechnics and Universities. These institutions are meant for the production of graduates who shall be self-reliant and contribute their quota for national development [5].

Colleges of Education (Technical) and some Polytechnics in

Nigeria offer NCE (Technical) courses in Technical and vocational education programme. The philosophy of Colleges of Education (Technical) is to provide technical lecturers with the intellectual and professional background adequate for teaching technical subjects and to make them adaptable to any changing situation in technological development not only in the country but also in the world at large [7]. Colleges of Education (Technical) offer courses in technical and vocational education and the students are expected to specialize in one of the following areas such as Automobile Technology, Building Technology, Electrical/Electronic Technology, Metalwork Technology, Woodwork Technology, Agricultural Education, Home Economic Education, Business Education and Fine and Applied Art.

The Automobile is derived from the Greek word autos, which mean self, and the French word mobile, which means moving. Today's self-moving vehicles are engineering marvels of safety and dependability [2]. Automobile is a wheeled motor vehicle used for transporting passengers, which also carries its own engine or motor. It is designed to run primarily on roads, have seating for one to eight persons, it typically has four wheels, and is constructed principally for the transportation of people and goods. Automobiles are classified by size, style, number of doors and intended use. The typical automobile, also called motor vehicle, car, and motorcar or passenger car, has four wheels and can carry up to six persons including a driver. Larger vehicles designed to carry more passengers are called vans, minivans, Omni-buses, or buses. Those used to carry cargo are called pickups or trucks, depending on their size and design Motor Vehicle Technology is one of the courses offered in Technical Education of the Colleges of Education (Technical). Automobile Technology Education is an aspect of Technical education offered in the Colleges of Education (Technical). This field of technical education trains students in areas related to the maintenance, repairs and services of automotive vehicle components. Adequate training is required in such technical area to enable students acquire the desired technical competence to face the challenges of work and teaching at junior secondary school level [7]. Automobile technology is taught by lecturers in Colleges of Education (Technical).

A lecturer is someone who has undergone the necessary and recommended training in a preparatory programme and is charged with the full responsibility of managing the classroom in such a way as to enhance the learning behavior of the students [8]. A graduate of a university who has undergone the necessary and recommended training in pedagogy and technical areas of the subject matter and has the capacity of teaching the content of the curriculum to students [4]. Therefore it is the responsibility of a lecturer to expose the students to knowledge, principles and technical skills in the content areas of automobile technology.

Automobile technology lecturers are the source of knowledge in both the class room and workshop environments. As scholars, they operate by analyzing, designing, implementing and evaluating teaching and learning activities. They establish activities that are measurable and achievable to their instruction. Technical lecturers should apply and manage the resources at their disposal and assess the achievement of the stated objectives. Since the curriculum essentially reflects the needs of society, it is the responsibilities of the lecturers to organize activities for students in such a manner to produce useful individuals who are functional and capable of satisfying the needs and aspirations of the society [3].

However, one of the major challenges for automobile technology lecturers is the innovations in present day modern vehicle systems. The use of electronic systems and advent of computer knowledge have changed the operating systems in modern vehicles [13]. The knowledge of Autotronics, which combines electronic circuits in automobile, has now posed a challenge to lecturers in automobile technology to meet up with the demands of modern technologies in automobiles. Similarly, the current global trend on carbon emissions has led to a lot of innovations in the fuel system of vehicles. Engines are designed to accommodate bio-fuels for combustion, that has led to a change in the design and operation of the engine systems. The properties and quality of alternative fuels is another challenge to the lecturers in trying to explain to the students their operation and describe how the system is constructed. Modern automobile engines are not available for such training and even where they are provided the automobile lecturers lack the competency, skills and expertise on the use of diagnostic and testing equipment to teach their students [13].

Modern automobiles are assemblage of a group of sophisticated technologies. These technologies include; Anti-lock Braking System (ABS), Electronic Fuel Injection (EFI), Variable Valve Timing Intelligence (vvt-i), On-board Diagnostic System (OBD), Autotronics and Mechatronics technology [8]. All these are not yet integrated in the present-day curriculum [7]. These are perceived as important to be integrated into appropriate modules of the curriculum of Automobile technology education [9].

In view of this, the need for capacity building of lecturers in educational institutions principally arises due to rapid advancement of technological innovations in automotive technology. The term capacity building emerged in the lexicon of international development during the 1990's [5]. Capacity building is included in the programs of most international organizations. Therefore, capacity building needs to be defined within the context of each organization [12]. In educational institutions the term capacity building in the effort geared towards improving an individual's level of knowledge, skills and attitudes essential in carrying out a given task [11]. Capacity building as a concept is closely related to education; training and human resource development (HRD). Capacity can be defined as the ability of individuals and organizations or organizational units to perform functions effectively, efficiently and sustainably [5]. Capacity building is the "development of knowledge, skills and attitudes in individuals and groups of people relevant in design, development, management and maintenance of institutional and operational infrastructures and processes

that are locally meaningful" Capacity building covers a number of aspects from training of lecturers to support for content development [6]. It highlights the critical issue that without adequate capacity building even well-designed policies and the most sophisticated technologies would not be able to achieve the desired results.

While there are many stakeholders involved in ensuring effective integration of modern technologies in the education system, lecturers have a particular important role to play. Lecturers are the key to whether technology is used appropriately and effectively [1]. Appropriate use of modern technologies can catalyze the paradigm shift from lecturer-centered pedagogy to a more effective learner-centered pedagogy. Capacity building of lecturers can play a major role in enabling this shift. It is impossible to deliver 21st Century education with 19th century tools. It's against this background that the study seek to investigate on capacity building needs of lecturers in modern automotive technologies for teaching automobile technology in Colleges of Education (Tech) in northern, Nigeria.

1.1. Statement of the Problem

Technical education is an educational process, involving in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitude and knowledge relating to occupations in various sectors of economic and social life. This entails that Automobile technology lecturers should be able to impart the knowledge, attitudes and the desired practical skills to students related to Automobile technology, in order to meet the demands, needs and aspirations based on the changes taking place within the technology age. One major challenge in Automobile technology is the change in present day modern vehicle systems. Electronics and the advent of computer have changed the operating systems in modern vehicles. The knowledge of Autotronics, which combines the inclusion of electronic circuits in automobile systems operation, has now posed a challenge to lecturers in such field of study. Modern automotive engines, tools, and equipment are not available for such training in most of the automobile workshops in the colleges and even where they are provided the automobile lecturers lack competency, skills, and expertise on the use of diagnostic and testing equipment, to teach the students on these emerging technologies.

The incorporation of new technologies with new subsystems and system components into modern automobiles have changed their configurations and made their maintenance a more complex task, even though some of the new systems make them easier to maintain. The curriculum for the technical and vocational education programme that train the service personnel for maintaining these vehicles has however, remained rigid, thus far removed from the recent technological innovation in automobiles. The gaps created between the curriculum and the new technological innovations have made it necessary to acquire the needed skills for effective maintenance of these new vehicles, which continues to elude the products of vocational and Technical Education programme. Most automobiles with these new innovations either suffer disrepair or have the new systems replaced by the classical substitute systems that the new ones were meant to improve upon. Yet some are even completely grounded just barely before its expected service lives span because of lack of competent personnel for their effective maintenance. As measures to keep education and training in tune with the knowledge and skills needed in the world of work, there is need to update lecturer's knowledge and skills regularly, through capacity building in line with changes that are taking place in the industries. Thus, it is imperative to investigate the new technological innovations in automobiles with the view to identify those that posed challenges to lecturers of automobile technology in Colleges of Education (Technical) in Nigeria, for integration into the curriculum of automobiles technology which were not included in the NCCE (2020) curriculum for NCE Technical programme.

1.2. Purpose of the Study

The main purpose of this study is to investigate on capacity building needs of lecturers in modern automotive technologies for teaching automobile technology in Colleges of Education (Tech) in northern, Nigeria. The specific objectives of this study include the following:

1) Capacity building needs of lecturers in (Autotronics) modern automotive electrical system.
2) Capacity building needs of lecturers in modern suspension, steering and braking systems.
3) Capacity building needs of lecturers in operating modern diagnostic tools and equipment in the workshops.

1.3. Research Hypotheses

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

1) There was significant difference in the mean ratings of responses of lecturers in Colleges of Education (Technical) and automotive industrial workers in modern automotive technologies in teaching (autotronics) automotive electrical system.
2) There was significant difference in the mean ratings of responses of lecturers in Colleges of Education (Technical) and automotive industrial workers on the capacity building needs of lecturers in modern automotive technologies in teaching steering and suspension system.
3) There is no significant difference in the mean ratings of responses of lecturers in Colleges of Education (Technical) and automotive industrial workers in operating modern diagnostic tools and equipment in the workshop.

2. Methodology

Survey research design method was adopted for the

study. The population for the study was 45, which comprises 25 lecturers of Automotive Technologies in Colleges of Education and 20 Industrial Workers of Automobile in Northern, Nigeria. There was no sampling because the population was of manageable size. A questionnaire consisting 71 items was developed and used for data collection. The questionnaire was face validated by one lecturer from Department of Automobile Technology, Federal College of Education (Tech) Bichi, Kano State and two from Department of Automobile Technology, Federal College of Education (Tech) Gombe State. Cronbach alpha reliability method was used in determining the internal consistency of the instrument. A reliability coefficient of 0.81 was obtained. Forty five copies of questionnaire were administered to the respondent with help of two research assistants. 40 copies of the questionnaire were retrieved and analyzed using the mean and improvement needed index to answer research questions. T-test statistic was employed to test the null hypotheses at 0.05 level of significant.

3. Presentation of the Result

3.1. Research Question 1

What are the capacity building needs of lecturers of Colleges of Education (Technical) in modern automotive technologies for teaching (autotronic) automotive electrical system?

Table 1. *Performance Gap Analysis of the Mean Responses of Lecturers of Modern Automotive Technologies on Capacity Building Needs in Teaching (Autotronic) Automotive Electrical System.*

S/n	Items	X_n	XP	PG X_n XP	Remark
1	Cary out general check on high energy ignition in electronic ignition system a no start condition of distributor less ignition system engine.	3.72	3.31	0.41	CBN
2	Read understand and follow sequentially assembly blue prints, repair manuals and specification.	3.55	3.67	-0.12	CBNN
3	Diagnose and carry out needed repairs on the emission system.	3.80	3.63	0.17	CBN
4	Diagnose and repair ignition system faults.	3.72	2.98	0.74	CBN
5	Test circuit for excessive resistance.	3.80	2.48	1.32	CBN

Key: CBN = Capacity Building Needed
CBNN = Capacity Building Not Needed

Data in table 1 revealed that 1 to 5 items had performance gap values ranged from 0.12 to 1.32 and were positive indicating that the lecturers of modern automotive technologies needed capacity building in 5 items. 1 out of 5 items had their performance gap (-0.12) and were negative indicating that the lecturers of modern automotive technologies did not need capacity building in the one item on working items but less emphasized on the two items with negative performance gap values.

3.2. Research Question 2

What are the capacity building needs of lecturers of Colleges of Education (Technical) in modern automotive technologies for Braking, Steering and Suspension System?

Table 2. *Performance Gap Analysis of the Mean Responses of Lecturers of Modern Automotive Technologies on Capacity Building Needs in Teaching Braking, Steering and Suspension System.*

S/n	Items	X_n	XP	PG X_n XP	Remark
1	Check the suspension arm.	3.68	2.21	1.47	CBN
2	Check the link bushes of the steering arm.	3.64	3.77	-0.13	CBNN
3	Replace the ball joint.	3.95	1.22	2.73	CBN
4	Carry out balancing and alignment of road wheels	3.91	2.87	1.04	CBN
5	Diagnose and rectify fault on steering mechanism.	3.61	2.88	0.73	CBN
6	Renew swivel pin bushing.	3.71	2.48	1.23	CBN
7	Diagnose and rectify fault on braking System	3.54	2.31	1.23	CBN
8	Replace brake lining and brake pad	3.62	2.04	1.22	CBN

Key: CBN = Capacity Building Needed
CBNN = Capacity Building Not Needed

Data in table 2 revealed that 1 to 8 items had performance gap values ranged from -0.13 to 2.73 and were positive indicating that the lecturers in modern automotive technologies needed capacity building in 6 items. Two out of 8 items had their performance gap of as follow (-0.31 and 0.38) and were all negative indicating that lecturers in modern automotive technologies did not need capacity building in the two items. Generally, lecturers in modern automotive technologies needed capacity building in the 6 items but less emphasizes on the two items with negative performance gap values.

3.3. Research Question 3

What are the capacity building needs of lecturers of Colleges of Education (Technical) in operating modern diagnostic tools and equipment in the workshop?

Table 3. *Performance Gap Analysis of the Mean Responses of Lecturers of Modern Automotive Technologies on Capacity Building Needs in Teaching modern diagnostic tools and equipment in the workshop.*

S/n	Items	X_n	XP	PG X_n XP	Remark
1	Read trouble code on computer value system.	3.68	2.21	1.47	CBN
2	Examine and Adjust computers and running automobile.	3.64	3.77	-0.13	CBNN
3	Diagnose and repair computer problems	3.95	1.22	2.73	CBN
4	Identify and use relays to execute computer command that is interdependent of sensors (input control) (out control).	3.91	2.87	1.04	CBN
5	Analyze the operation of computer System and liable (associate problem On-board diagnostic (OBD} -Understanding computer applications carry out modification (technology design to generate or adopt equipment and technology to serve users need.	3.61	2.88	0.73	CBN
6	Diagnose and service the sensors that operate lifesaving components in air bag.	3.71	2.48	1.23	CBN
7	Prevent sudden acceleration	3.54	2.31	1.23	CBN
8	Interpret charts and service manuals.	3.62	2.04	1.22	CBN
9	Inspect drive belt.	3.81	2.92	0.89	CBN
10	Read trouble code on computer value system.	3.95	1.22	2.73	CBN

Key: CBN = Capacity Building Needed
CBNN = Capacity Building Not Needed.

Data in table 3 revealed that 16 out of 18 items had performance gap values ranged from -0.13 to 2.73 and were positive indicating that the lecturers of Automobile Technology needed capacity building in 9 items. One out of 10 items had their performance gap as follows (-0.13) and are negative indicating that lecturers of Automobile Technology do not need capacity building in the one items on determine the ignition using timing light and using compression gauges and determine cylinder pressure. Generally, Automobile Technology Lecturers needed capacity building in the 9 items but less emphasizes.

3.4. Hypothesis 1

There is no significance difference between the mean ratings of responses of lecturers in College of Education (Technical) in teaching (autotronic) automotive electrical system.

Table 4. *The t-test Analysis of the Mean Responses of the Respondents on the Capacity Building Needs of Lecturers in Modern Automotive Technologies for Teaching (Autotronic) Automotive Electrical System.*

S/N	Items Statements	X_1	S^2_1	X_2	S^2_2	t-cal	Remarks
1.	Carryout general check on high ignition in electronic ignition system a no start condition of distributor less ignition system engine.	3.75	1.08	3.90	0.97	0.78	NS
2.	Read, understand and follow sequentially assembly blue prints, repair manuals and specification.	4.01	0.81	3.76	1.04	1.51	NS
3.	Diagnose and carry out needed repairs on the emission system.	4.11	0.95	4.04	0.90	0.41	NS
4.	Diagnose and repair ignition system fault.	4.00	1.04	3.96	1.14	0.20	NS
5.	Test circuit for excessive resistance.	3.77	0.93	3.84	0.91	036	NS

N1=25, N2 =20.

Data presented in table 4 revealed that each of the items had their calculated t-values range from 0.20 to 151 which were less than t-table values of 1.98 at 0.05 level of significance difference between the mean responses of lecturers in modern automotive technology in College of Education (Technical) and automotive industrial workers on the capacity building needs of lecturer in modern automotive technologies for teaching (Autotronic) Automotive Electrical System.

Therefore, the null hypothesis of no significant difference between the mean responses of lecturers in modern automotive technology in College of Education (Technical) and automotive industrial workers on the capacity building needs of lecturer in modern automotive technologies for teaching (Autotronic) Automotive Electrical System was accepted.

3.5. Hypothesis 2

There is no significant difference between the mean rating of responses of automotive technology lecturers in Colleges of Education (Technical) in teaching braking, steering and suspension systems.

Table 5. *The t-test Analysis of the Mean Responses of the Respondents on the Capacity Building Needs of Lecturers in Modern Automotive Technologies for Teaching braking, steering and suspension Systems.*

S/N	Items Statements	X	S^2_1	X_2	S^2_2	t-cal	Remarks
1.	Check the suspension arm.	4.34	0.85	4.04	1.08	1.04	NS
2.	Check the link bushes of the steering arm	4.27	0.82	4.08	1.14	1.01	NS
3.	Replace the ball joint.	3.47	1.12	3.42	1.13	0.24	NS
4.	Carry out balancing and alignment of road wheel.	3.86	0.90	3.98	0.99	0.68	NS

S/N	Items Statements	X	S^2_1	X_2	S^2_2	t-cal	Remarks
5.	Diagnose and rectify fault on steering mechanism.	3.19	1.015	3.22	1.14	0.13	NS
6.	Renew swivel pin bushing.	3.47	1.16	3.28	1.16	0.89	NS
7.	Diagnose and rectify fault on braking system.	3.70	0.85	3.80	0.88	0.56	NS
8.	Replace brake lining and brake pad.	4.27	0.82	4.08	1.14	1.01	NS

N1=25, N2 =20.

Data presented in Table 5 revealed that each of the items had their calculated t-values range from 0.13 to 1.04 which were less than t-table value of 1.98 at 0.05 level of significance and at 81 degree of freedom (df). This indicated that there was no significant difference between the mean responses of lecturers of automotive technology in College of Education (Technical) and automotive industrial workers on the capacity building needs of lecturer in modern automotive technologies for teaching braking, steering and suspension system.

Therefore, the null hypothesis of no significant difference between the mean responses of lecturers of automotive technology in College of Education (Technical) and automotive industrial workers on the capacity building needs of lecturer in modern automotive technologies for teaching steering and suspension system was upheld.

3.6. Hypothesis 3

There is no significance difference between the mean ratings of responses of lecturers in College of Education (Technical) in teaching On Board Diagnoses (OBD) System modern diagnostic equipment.

Table 6. *The t-test Analysis of the Mean Responses of the Respondents on the Capacity Building Needs of Lecturers in Modern Automotive Technologies for Teaching On Board Diagnoses (OBD) System modern diagnostic equipment.*

S/N	Items Statements	X_1	S^2_1	X_2	S^2_2	t-cal	Remarks
1.	Read trouble code on computer value system.	3.02	1.51	3.14	1.56	0.39	NS
2.	Examine and adjust computer s and running automobile.	3.05	1.19	3.02	1.53	0.14	NS
3	Diagnose and repair computer problems.	3.68	0.86	3.34	1.09	1.30	NS
4.	Identify and use relays to execute computer command that is interdependent of sensors (input control) (output control)	3.90	0.95	3.62	1.10	1.51	NS
5.	Analyze the operation of computer system and liable (associated problem On-Board Diagnostic OBD).	3.76	1.08	3.84	1.03	0.38	NS
6	Understanding computer applications and carryout modification (technology design to generate or adopt equipment and technology to serve users need).	4.0	1 0.8	3.84	0.90	1.08	NS
7	Diagnose and service the sensors that operate lifesaving components in air bag.	4.04	1.12	4.00	1.14	0.19	NS
8	Prevent sudden acceleration.	4.05	1.07	3.94	1.01	0.59	NS
9	Interpret charts and service manuals.	4.00	1.00	3.82	1.00	0.97	NS
10	Inspect drive belt.	4.09	0.98	4.04	0.98	0.31	NS

N1=25, N2 =20.

Data presented in table 6 revealed that each of the items had their calculated t-values ranged from 0.14 to 1.51 which were less than t-table value of 1.98 at 0.05 level of significance. This indicated that the responses of lecturers in modern automotive technology in College of Education (Technical) and automotive industrial workers on the capacity building needs of lecturer in modern automotive technologies for teaching On Board Diagnoses (OBD) System modern diagnostic equipment.

Therefore, the null hypothesis of no significant difference the mean responses of lecturers in modern automotive technology in College of Education (Technical) and automotive industrial workers on the capacity building needs of lecturer in modern automotive technologies was upheld.

4. Conclusions

Based on the findings of the study, the following conclusion are drawn: Student of vocational and technical education at all levels can only acquire needed skills for employment after graduation if they acquire the required skills for the students to possess these skills, there is need to build the capacity of lecturers of automotive technology based on the findings of this study.

5. Recommendations

Based on the findings of the study, the following recommendations are made:

1) Workshop and seminars should be organized for lecturers of automotive technology on modern automotive engine system, transmission system, automotive electrical system (Autotronics) and use of modern diagnostic equipment in order to build their capacity.
2) Lecturers of automotive technology in Colleges of Education (Technical) should be also sent for further training in the Universities in order to acquire more knowledge in their area of specialization.
3) Training equipment, machine and books should be provided to schools offering Automotive Technology by government and philanthropists in the society for effective training.

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