Indian Journal of Management and Language (IJML)
ISSN: 2582-886X (Online), Volume-1 Issue-2, October 2021

Relevant Interactive Learning Strategies Needed for Training of Polytechnic Pre-Service Technicians for Diagnosis and Repairs of Modern Automobilesin North-Eastern Nigeria

Babayo Yakubu Adamu, Babawuro Shuaibu, QS Adamu Abdulkadir Maigana, Umar Magaji

Abstract: ***The main purpose of this study was to determined competency training needs of polytechnic Pre-service technicians for diagnosis and repairs of modern automobiles in North-Eastern Nigeria. The study sought to answer two research questions using CompetencyOutcomePerformanceAssessment (COPA) model framework. It is paramount importance to note that competency training needs of diagnosis and repairs of modern cars requires practical and effective training skills to be able to adequately repair them. A descriptive survey research design was adopted for the study. The population for the study was made up of 384 technicians in automotive technology in the NBTE accredited polytechnics in Northern Nigeria. Out of 384 a sample of 192 was randomly selected for the study. The questionnaire consisted of 192 tasks on diagnosis and repairs skills needed, developed with reference to curriculum of National Automobile Technician Education (NATE) and National Vocational Certificate in Automotive / Mechatronics approved by National Board for Technical Education. The questionnaire was divided into two sections: A & B, (see Appendix I). Section A contains items designed to obtain personal information of the respondents, while section B is divided into four sub-sections (I, II, III & IV). The instrument was developed using COPA Model structure, adapted from Lenburge et al (2009). A four-point rating scale ranges from Highly Needed (HN) = 4, Needed (N) = 3, Moderately Needed (MN) = 2, Least Needed (LN) = 1 was employed in sub-section I, while four-point rating scaled ranges from most relevant (4), highly relevant (3), moderately relevant (2) and less relevant. A reliability test of the instrument was also conducted and analyzed using Cronbach Alpha coefficient method and yielded an overall reliability coefficient of 0.80. Data generated from the use of the questionnaire was analyzed with Statistical Package for Social Sciences (SPSS) 23rd version software using mean and standard deviation to answer the research questions. Findings revealed relevant interactive strategies needed in the training of polytechnic Pre-service Technicians in diagnosis and repairs of modern Automobiles. Based on the findings of the study, appropriate recommendations were made, among which is, that the identified modern technology skills should be integrated into the curriculum of Automotive Technology programme in Nigerian polytechnic.***

Identified interactive skills will help lecturers in developing lesson plan using the competencies that are essentially needed by Pre-service automotive technicians in order for them to prepare on how to teach them appropriately.

Keyword: ***The study sought to answer two research questions using CompetencyOutcomePerformanceAssessment (COPA) model framework.***

I. INTRODUCTION

For effective interactive training of technicians in diagnosis and repairs of modern automotive, competencies in terms of attitude, skills and abilities need to be identified and embedded into the curriculum. essential interactive strategies in basic electronics and modern technologies, modern automotive sensors and actuators to enhance effective training service delivery in Nigeria, trainers who are abreast with the trends in the theory and practice of automobile technicians should imbibe continuous professional development as a capacity building exercise due to the current challenges of automobiles diagnostic and scan tools. The main objective of polytechnic education is the promotion of technical and vocational education as well as training, technologies transfer as a well skills development to enhance the socio-economy advancement of the country. The polytechnic education system is structured into three (3) programme namely; National Diploma (ND) two years programme, Higher National Diploma two years programme (HND) and Certificates courses as one year programme in the areas of science, technology and engineering. For decades educational sectors has recognized that skills training is decreasing in our polytechnic education system as students tend to be more exposed to rote learning than the competency to operate positively in the labor market.

Modern automobile are a blend of 20th century and 21st century technology. The designs of modern cars have advanced to a very sophisticated level. Unlike the old mechanically operated vehicle systems, the modern cars are being operated and controlled by a computerized electrical sensors indeed, almost every other function within the engine is controlled by an on-board computer (Akinola, 2015) Brain Box System.

Moreover, common to majority of the new trend cars with the brain box and other electronic gadgets that sense instant faults in the vehicle and immediately notify the driver through the dash board display.

Manuscript received on 22 March 2021 | Revised Manuscript received on 06 April 2021 | Manuscript Accepted on 15 October 2021 | Manuscript published on 30 October 2021.

***** Correspondence Author

Babayo Yakubu Adamu*, Department of Vocational and Technical Education Abubakar Tatari Ali Polytechnic, Bauchi. E-mail: babayoyakubuadamu50@gmail.com

BabawuroShuaibu, Department of Vocational Technology Education, Faculty of Technology Education, Abubakar Tafawa Balewa University, Bauchi E-mail address:babawuroshuaibu@gmail.com

QS Adamu Abdulkadir Maigana,Abubakar Tatari Ali Polytechnic, Bauchi. E-mail: adamuabdulkadirmaigana@gmail.com

Umar Magaji,AbubakarTatari Ali Polytechnic, Bauchi. E-mail: umarmagaji123@gmail.com

The modern trend of mechanical services therefore, require the use of more complex and highly technological diagnostic equipment to analyse vehicle faults for repair and service to ensure the efficiency, safety, comfort through interactive learning processes competent professionals hand are required (Chron, 2014). For many years, automotive electricians just needed to understand basic electrical wiring principles, due to increase in the complexity of the automobile industries need to understand complex wiring circuits with solid-state computer control, along with the basics (Peugeot Automobile Nigeria, 2015). In addition, Peugeot Automobile of Nigeria (2015), identified the daily tasks of modern automotive technician to include but not limited to:

1. Diagnosing the source of problems
2. Using electronic testing equipment
3. Reading and interpreting the output of diagnostic equipment
4. Figuring out how to fix problems once they are diagnosed
5. Using technical manuals, reading charts and diagrams
6. Repairing, overhauling, or replacing systems and parts
7. Doing routine maintenance like oil changes and tire rotation and
8. Work-site auto design, maintenance of tools and equipment

An automotive technology students are expected to be able to interact freely and have theability to diagnose electronic and electrical problems, interpret measurement, read sensors and actuators on automobiles becomes something of great importance (Wright, 2013).

It is based on the philosophy of competence-based practice-oriented methods and outcomes and is organized around four essential conceptual pillars: the specification of essential core practice competences, end-result competency outcomes, practice-driven interactive strategies and objective competences performance examinations in all for courses effective implementation of the COPA model requires schools to implement the four core-competencies, the omission of any competency deprives the learner of experiences to develop essential skill and apply them in diverse settings as they focus on skills acquisition and the knowledge required for actual practice. It is against this background that the researcher conducts a study on competency needs of automotive technology polytechnic students in Northern-Nigeria with a view to identifying their training needs that are required for repairs and maintainanceof modern automotive vehicles in industries.

II. STATEMENT OF THE PROBLEM

Polytechnic education is the bedrock of development, is faced with a myriad of challenges, and training, the United Nations Educational, Scientific, and Cultural Organisation's (UNESCO) recommended 26 per cent of the national budgets to educational sector despite that education has been very low, hindering effective teaching and learning (Usman, 2015).In Nigerian education system, the background level of the programmes for education and training of craft men and master craft men for the maintenance of motor vehicles are carried out in technical colleges at National Technical Certificate (NTC) in addition to that, Intermediate Technical Certificate (ITC) and Advance National Technical Certificate (ANTC) is a certificate course offered at the polytechnic respectively. A one (1) year programme meant to take care of those that cannot be admitted into National Diploma ND levels (NBTE, 2013). However, a study conducted by (Odigiri, 2010) have revealed that the products of the NTC, ITC and ANTC programmes lacked the basic skills needed for gainful employment in present day automotive industries. The nature of the training is often blamed on inadequacy and irrelevant skills needed to meet the challenges in the maintenance of modern automotive.

Furthermore, skill gap analysis conducted by the National Automotive Council (NAC) of Nigeria in 2014 revealed that much is needed for the training of automobile service technicians as majority of them lacked the skills and equipment to properly maintain modern vehicles (Jalal, 2009). This calls for reason and justification of such a study to be conducted to identify relevant interactive learning strategies and skill needs of the technicians programmes of polytechnic reviews.

III. OBJECTIVES OF THE STUDY

The main purpose of the study was to determine the competency training needs of polytechnic Pre-service automotive technicians for diagnosis and repairs of Modern vehicles in Northern Nigeria using competency outcome performance assessment (COPA) model approach as a guide. Specifically, the study sought to: -

1. Find out whether the most relevant interactive learning strategies are linked to the outcome statements that integrates those competencies needed for diagnosis and repair of the modern automobile in northern Nigeria.
2. Establish weather the most relevant performance evaluation methods are utilize to validate achievement of outcomes of the competencies needed for diagnosis and repair of modern automobile in northern Nigeria.

Research Questions

The following research questions were formulated to guide the study:

1. What are the relevant interactive learning strategies that are link to the outcome statement needed for diagnosis and repair of Modern Automobiles in Northern Nigeria?
2. What are the most performance evaluation methods that are used to validate achievement needed for diagnosis and repairs of Modern Automobile in Northern Nigeria?

IV. METHODOLOGY

This chapter describes the procedure follows in carrying out the study under these sub-headings:- the design of the study, area of the study, population, sample and sampling techniques, instrument for data collection, validation of the instrument, reliability of the instrument, method of data collection and method of data analysis.

The design of the study was a descriptive surveybecausewhich is best served to answer the questions and the purposes of the study. The survey research is one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group. Tuckman (1999) explained that in a descriptive survey, variables are frequently studied using a simple counting procedure with little or no attempt made to determine in a systematic fashion the relationship between them and other relevant variables. Nworgu (2006), define survey as a process of collecting data and describing it in a systematic manner or facts about a given population. Sambo (2005) further observed that a survey is the process of gathering information about many people or objects by studying a representative sample of the entire group. Therefore, with a representative sample of the larger population of interest, one will be able to gather data covering competencies, outcome, performance/teaching strategies and assessment/evaluation from all the possible sources from which the sample will be drawn in this study.

The geographical area of the study was Northern Nigeria. Northern Nigeria comprised of: Adamawa, Bauchi, Borno, Gombe, Yobe, and Taraba, states.

The target population for the study was defined to include all technologists in the area of automotive technology in both state and federal Polytechnics in Nigerian, while the accessible population is the technologist within the researcher's reach. In this study the accessible population comprised of 93 technologists in the 7 polytechnics in North-Eastern Nigerian. Table 1 reveals the details record of the number of technologists in Northern Nigeria as indicated. Most of them have had several years of teaching automotive technology and therefore, they are in the best position to furnish the researcher with the information needed to answer the research question of this study.

Table 1: Population of Technologists in Polytechnics in Northern Nigeria.

S/N	INSTITUTIONS	LOCATION	NUMBER OF TECHNOLOGISTS
1	Adamawa State Polytechnic	Yola	16
2	Federal Polytechnic, Damaturu	Yobe	12
3	Idris Aloma Polytechnic	Gaidam	5
4	Abubakar Tatari Ali, Polytechnic	Bauchi	17
5	Federal Polytechnic, Bauchi	Bauchi	24
6	Ramat Polytechnic	Maiduguri	15
7	Federal Polytechnic	Bali	10
	Total		**103**

Digest of Statistic of Vocational and Technical Education ,**Source: -** NBTE (2014).

Northern- Eastern Nigeria comprises of six states namely: Adamawa, Bauchi, Borno, Gombe, Yobe, and Taraba,. A purposive sampling technique was used to select 4 out of the 6 states offering automotive technology in respective of their proprietorship include: Adamawa, Bauchi, Gombe, Yobe.A total of 67 technologist were sampled as part of the study out of the population of 93 using (Kregcie and Morgan, 1970) method of sampling techniques and a stratified proportionate random sampling using three cluster such as Bauchi / Gombe, Taraba / Yobeand Adamawa/ Borno Central sampling method of the schools that were involve in the study This technique was employed to ensure a fairly equal representation of the variables for the study. The stratification was based on state polytechnics and federal polytechnics in North-Eastern zone of Nigeria. The proportionate stratification was based on the fact that, they were done based on the percentage in each school involve in the study as indicated in the Table II for further clarification.

Table 2: Sample Size of Technologist in Polytechnics in Northern Nigeria.

S/N	Schools.	Location	Pop. of technicians	Percen t (%)	Sample-pop. of technicians
1	Adamawa State Polytechnic	Yola	16	.72	12
2	Federal Polytechnic, Damaturu	Yobe	12	.72	9
3	Idris Aloma Polytechnic	Gaidam	4	.72	2
4	Abubakar Tatari Ali, Polytechnic	Bauchi	17	.72	12
5	Federal Polytechnic, Bauchi	Bauchi	24	.72	17
6	Ramat Polytechnic	Maiduguri	15	.72	11
7	Federal Polytechnic Bali	Adamawa	10	.21	4
			93		**67**

Digest of Statistic of Vocational and Technical Education, **Source: -** NBTE (2014).

Kregcie and Morgan Sample Table (1970), pg 157

The instrument for data collection was a structured questionnaire titled: Relevant InteractiveLearning Strategies Needed for Automobile Polytechnic Pre-service Technicians Questionnaire (RILSNAPPTQ). The questionnaire consisted of 42 tasks on diagnosis and repair skills needed by Polytechnic Pre-service Technicians, adopted from the curriculum of National Automobile Technician Education (NATE) and National Vocational Certificate in Automotive / Mechatronics as approved by National Board for Technical Education, (NBTE). The questionnaire is divided into two parts: I & II. Part I contains items designed to obtain personal information of the respondents, while Part II contains 21 items on relevant interactive learning strategies and performance assessment methods for validating the achievement of the desire outcomes presented as presented in research question two. The instrument was developed based on the framework of COPA Model, adapted from Lenburge et al (2009). A four-point rating scale ranging from Highly Needed (HN) = 4, Needed (N) = 3, Moderately Needed (MN) = 2, to Least Needed (LN) = 1 was employed in sub-section I, while four-point rating scaled ranging from Most relevant (4), Highly relevant (3), Moderately relevant (2) to Less relevant = 1 was also used. A total of 93 questionnaires were administered and retrieved via personal contact with the respondents. The data generated were subjected to analysis using mean and standard deviation with the help of Statistical Package for Social Sciences (SPSS) version 23 (2015). The result was interpreted as follows:

1. Mean of 1.00 to 1.49 = Moderately Needed/Moderately Relevant
2. 1.50 to 2.49 = Needed/ Relevant,
3. 2.50 to 3.49 = Highly Needed/Highly Relevant,
4. 3.50 to 4.00 = Most Needed/Most Relevant.

V. RESULTS

This chapter presented the results of the data analyses, findings of the study and discussion of the findings. The results are presented in tables with discussion. Mean and standard deviation statistical tools were employed for the analysis of data for all of the research questions.

Results

The results for the research questions are presented as follows:

Table 1: Mean and Standard deviation on the relevant Interactive Learning Strategies needed by Polytechnic Pre-service Technicians in Northern Nigeria.

S/N	Interactive Strategies	N	$\bar{X}$	Std	Remarks
1	Interactive power point to show the structure of the Engine Management System	93	3.52	.659	Most Relevant
2	Using project approach to show basic operation of Modern Auto-Electronic components	93	3.52	.679	Most Relevant
3	Using project approach to show the function of Modern Automobile Exterior Accessories	93	3.44	.645	Highly Relevant
4	Using interactive white-board to show how to detect different types of Automobile – Sensors	93	3.52	.664	Most Relevant
5	Using power point/videos clip to demonstrate inspections, fault and diagnosis of various engine sub-system	93	3.44	.684	Highly Relevant
6	Demonstrate with the aid of projector how to check and repair vehicle battery, charging, electric supply and starting systems.	93	3.52	.604	Most Relevant
7	Using computer animations to practically demonstrate various types of vehicle electronic control systems	93	3.60	.628	Most Relevant
8	Using videos clip to show how measuring instruments and equipment to check and repair various types of vehicle electronic control systems	93	3.44	.650	Highly Relevant
9	Using power point to show fault diagnosis on vehicle emission control systems	93	3.44	.690	Highly Relevant
10	Showing practically by computer and simulation AC and DC Technology for Modern Automobile	93	3.44	.681	Highly Relevant
11	Showing practically how to conduct Electronic Diesel Control (EDC) analysis	93	3.60	.621	Most Relevant
12	Using practical approach to check and repair vehicle transmission systems	93	3.44	.708	Highly Relevant
13	Show practically using white board and a projector how to conduct fault diagnosis on vehicle transmission systems	93	3.52	.609	Most Relevant

14	Using power point to show fault diagnosis on various vehicle fuel supply systems	93	3.52	.651	Most Relevant
15	Show practically the structure and operating principles of various vehicle ignition systems	93	3.52	.710	Most Relevant
16	Practically demonstrate how to check and repair electromechanically braking system	93	3.44	.725	Highly Relevant
17	Using interactive white board to show fault diagnosis on electromechanically braking systems	93	3.52	.688	Most Relevant
18	Using video-clip to conduct check and repairs on electromechanically power steering systems	93	3.60	.216	Most Relevant
19	Using practical approach to show faults and diagnoses of steering system problems	93	3.44	.748	Highly Relevant
20	Using power point to demonstrate how to check and repair vehicle suspension systems	93	3.44	.734	Highly Relevant
21	Demonstrate practically using computer simulation how to carryout fault diagnosis on vehicle suspension systems	192	3.44	.745	Highly Relevant
	Grand Mean		**3.49**	**0.654**	

To answer research question 3 the data collected was subjected to analysis using Mean and Standard deviation with the help of SPSS. Table 3 shows the results on the most relevant interactive learning strategies to validate achievement of those competencies needed by Polytechnic Pre-service technicians for diagnosis and repair of modern automobile. Results of items 7, 11, and 18 have shown that the most effective interactive learning strategies are mostly relevant as revealed by pre-service technicians for diagnosis and repair of modern automobiles with the items having the mean score of 3.60 and a standard deviation of .628,.621 and .216 respectively. The remaining 18 items on most relevant interactive learning strategies are rated as highly effective by the respondents with the mean score ranges between 3.44 to 3.52, the overall average of the standard deviation obtained is .654 therefore, it can be concluded that all the 21 learning strategies are effective for diagnostic and repair of modern automobile in Polytechnics in Northern Nigeria.

Table 2:Mean and Standard deviation on the relevant Performance Assessment Methods in validate achievement of outcomes for diagnosis and repairs of Modern Automobile in Northern Nigeria.

S/N	Performance Assessment	N	$\bar{X}$	Std	Remarks
1	Adopting Real work/real time activities at the workplace	93	3.44	.599	Highly Relevant
2	Using work activities in a simulated workplace	93	3.44	.619	Highly Relevant
3	Using simulation exercises/role-plays,	93	3.44	.674	Highly Relevant
4	Using Projects to teach the required competency	93	3.44	.685	Highly Relevant
5	Using Demonstrations to teach required competency	93	3.52	.666	Most Relevant
6	To use activity sheets to assess the essential competency	93	3.52	.652	Most Relevant
7	Presentations / Using Oral answers to pose questions to students to assess learning outcome	93	3.52	.661	Most Relevant
8	Written questions to assess performance	93	3.52	.681	Most Relevant
9	Using Interviews to validate achievement	93	3.44	.735	Highly Relevant
10	Used Self-assessment to determine the achievement of competency	93	3.44	.654	Highly Relevant
11	Use of Questionnaires to validate the essential competency	93	3.44	.662	Highly Relevant
12	Verbal questioning to assess performance competency	93	3.44	.683	Highly Relevant
13	Portfolios/Collections of work samples	93	3.44	.642	Highly Relevant
14	Activities sheets/log books/Checklists	93	3.44	.663	Highly Relevant
15	Using Testimonials/reports from employers/ supervisors	93	3.44	.668	Highly Relevant
16	Using Evidence of training / authenticated prior achievements to visit of work place to assess students	93	3.52	.656	Most Relevant
17	Interviews with employers, supervisors or peers	192	3.44	.661	Highly Relevant
18	Using Models/Posters/Graphics to assess students learning outcomes	192	3.52	.628	Most Relevant

S/N	Performance Assessment	N	$\overline{X}$	Std	Remarks
19	Use of Video/Audio tapes to assess students	192	3.20	.628	Highly Relevant
20	Observing individual students/Giving assignment to assess performance	192	3.36	.653	Highly Relevant
21	Adopting User manuals as a guide to assess learning outcome	192	3.44	.668	Highly Relevant
	Grand Mean		**3.44**	**0.658**	

To answer research question four the data collected was subjected to analysis using Mean and Standard deviation with the help of SPSS. Table 4 shows the results on the relevant performance assessment methods that validate achievement of outcomes required by Polytechnic Pre-service technicians for diagnosis and repair of modern automobile. The results of the 21 items have shown that the relevant performance assessment methods that validate achievement of outcomes of 1 to 21 items are highly relevant by pre-service technicians for diagnosis and repair of modern automobiles with all the 21 items having a mean score between 3.20 to 3.52 and standard deviation ranging from .599 to .735 respectively. The grand mean average of the 21 items is 3.44 therefore, it can be concluded that all the 21 performance assessment methods are highly relevant for diagnostic and repairs of modern automobile required by Pre-service technicians in Polytechnics in Northern Nigeria.

VI. DISCUSSION OF THE FINDINGS

The research question one revealed that Competencies in Basic Electronics and Technology of modern Automobile, Diagnosis and Repair of Electronic sensor and Actuator on Modern Automobile System, Transmission System/Fuelling system and Modern Automobile Steering, Braking and Suspension system are essentially needed in training of polytechnic Pre-service Technicians in diagnosis and repairs of modern Automobiles.

Automotive technicians just needed to understand basic electrical wiring principles, such as power and ground. Today's automotive technicians due to increase in the complexity of the automobile industries need to understand complex wiring circuits with solid-state computer control, along with the basics. This implies that for technician to perform diagnosis and repair he/she needs to be competent in basic electronics and technology.

The research question 2 further revealed that the most interactive learning strategies that integrate the essential competencies needed for training of Polytechnic Pre-service Technicians for diagnosis and repairs of Modern Automobile can be the use of interactive power-point, using project approach, using video clip, demonstration with the aid computer simulation. This finding is in agreement with the above result showing that the learning interactive strategies are effective and needed for the training of polytechnic Pre-service technicians these study buttress the findings of Tecnológico de Monterrey French, (2015)as part of its 2015's mission aiming to develop a complete re-design of modern automobile system for its educational purpose using demonstration, project approach,and collaborative learning to dramatically challenging the traditional environment based on the learning of modern automobile technology. In this new model, the main role of the learning process is played by the student rather than the teacher. Collaborative learning is combined with individual work, so that the exploration of the student complements without replacement of the lecturers.

The research question 2 revealed that most effective performance assessment methods that validate achievement of outcomes required of essential competencies as needed by the Polytechnic Pre-service Technicians for diagnosis and repairs of Modern Automobile in Northern Nigeria the study revealed that most effective performance assessment methods that validate achievement of outcomes required of essential competencies as needed by the Polytechnic Pre-service Technicians for diagnosis and repairs of Modern Automobile are; adopting real work/real time activities at the workplace, using work activities in a simulated workplace, using simulation exercises/role-plays, using projects to teach the required competency, using demonstrations to teach required competency, to use activity sheets to assess the essential competency, Presentations / using oral answers to pose questions to students to assess learning outcome, written questions to assess performance, using Interviews to validate achievement, used self-assessment to determine the achievement of competency as supported by Tecnológico de Monterrey French, (2015) that learning can be evaluated using different methods as the students acquire knowledge and skills through practice and reflection instead of watching and listening.

Active learning promotes long-term retention of information, comprehension, problem-solving skills, motivation to learn and subsequent interest in the subject. Besides, active learning methods make workshops much more enjoyable for both students and technicians as the use of projects to teach the required competency to evaluate performance, demonstrations to teach required competency and assessed students understanding applied as well. The researcher further state that once a workshop starts on a problem, the workshop becomes a place for: discussions, arguments, tests, etc. Concerning collaborative learning,

The findings, was in agreement with the findings as contained in the performance evaluation methods for the training of the polytechnic pre-service technicians for diagnosis and repair of modern automobile in northern Nigeria. Therefore, whatever remedies are proffered to reduce the effect of the identify obstacles should as well apply to other colleges of education technical and Nigerian universities in Nigeria.

VII. CONCLUSION

The purpose of the study was to determine competencies needed for Pre-service polytechnic technicians for the diagnosis and repairs of modern automobile in northern Nigerian polytechnics.

The research question 1, analyze and interpreted. Based on the finding of this study, it was concluded that, technicians need to be train on 21 essential interactive learning strategies for them to be able to carry out diagnosis and repairs on modern automobiles. Specifically, technicians need to be train in electronic sensors and actuators, basic electronic technology of modern automobile, fault diagnosis and repair of modern automobile transmission system and faults and repairs of modern automobile steering, braking and suspension system as contained in the findings of the study.

It was also concluded that the research question one on most effective interactive learning strategies that integrate the essential competencies needed for training of Polytechnic Pre-service Technicians for diagnosis and repairs of Modern Automobile are interactive power-point, project approach, use of video clip, demonstration with the aid of computer simulation and showing practically.

Finally, the research question two concluded that, the most effective performance assessment methods that will validate the achievement of outcomes of needed essential competencies by Polytechnic Pre-service Technicians for diagnosis and repairs of Modern Automobile are; Real work/real time activities at the workplace, work activities in a simulated workplace, simulation exercises/role-plays and projects. The use of presentations/oral answers, written questions to assess performance, Interviews to validate achievement, Self-assessment to determine the achievement of competency, self-assessment, Activities sheets/log books/Checklists, Questionnaires to validate the essential competency, Verbal questioning to assess performance competency, using Models/Posters/Graphics to assess students learning outcomes and Observing individual students/Giving assignment to assess performance are opined to be effective for validating the achievement of essential competencies training needed by polytechnic Pre-service technicians to diagnose and repairs Modern Automobile effectively.

RECOMMENDATIONS

Based on the finding of this study, the following recommendations are stated as follows:

i. Identified most effective interactive learning strategies that integrate the essential competencies needed for training of Polytechnic Pre-service Technicians for diagnosis and repairs of Modern Automobile will help the lecturers/instructors to identify the appropriate learning strategies to be apply when delivering the lesson for Technicians as regard to diagnosis and repairs of Modern Automobile in Nigerian polytechnic.

ii. Identified most effective performance assessment methods that validate achievement of outcomes of required essential competencies needed by Polytechnic Pre-service Technicians for diagnosis and repairs of Modern Automobile will help lecturers in evaluating process before, during and after the lessons in identifying the appropriate evaluation techniques as per the treated topic for training of Polytechnic Pre-service Technicians for diagnosis and repairs of Modern Automobile in Nigerian polytechnic.

REFERENCES

1. Abdulsalam, S. (2005). *Research Methods in Education***.** Stirling-Horden Publishers Nigeria Limited.
2. Akinola, A. O. (2010). Parts Standardization in the Motor Industry. M. Eng. Thesis, Department of Mechanical Engineering Federal University of Technology, Akure, Nigeria.
3. Alveno, &Strandford, O. (2010). Emerging skills: Implications for voc. ed. information seriesNo. 234**.** The National Center for Research in Vocational Education, Ohio State University, Columbus, OH.
4. Chron, (2014).Factsheet: what kind of Equipment does an Auto Mechanic use? (Online). *Available at http://www.work, chron/kind -equipment-auto- mechanic-use -25000,html.* (Accessed on 30th August, 2014).
5. Elobuike, H.U. (2008). Relevance of Technical College Electrical/ElectronicsandMechanical/Automotive Programmes to the Needs of Industries in Anambra, Ebonyi and Enugu states, *Unpublished PhD Thesis*, Department of Vocational Teacher Education, University of Nigeria Nsukka.
6. Ezeama, A.O. (2016). Capacity Building Needs of Motor Vehicle Mechanics Teachers in Technical College in Enugu State. *Unpublished M. Ed Tech* Project Report, Departmentof Industrial Technical Education, University of Nigeria Nsukka.
7. Erjavec, J. (2010). Automotive technology: A system approach. **USA**: Cengage Learning Inc.
8. Federal Republic of Nigeria (2004) *National Policy on Education* (NPE, Lagos, NERDC Press, pp, 17-20.
9. Haruna, A, Usman O and Abdul A. (2015). *Autotronics course-An innovativeapproach in automotive technology education in Africa for sustainable development.*
10. Jalal, A.M. (2009), Strategies in Place to Rescue Autos Sector, retrieved from *http://www.autosinsight.com/file/85997/strategies-in-place-to-rescue-autos sector.html On 26/08/2010.*
11. Jamila, Shuara. (2010). Higher Education Statistics-Nigeria Experience in data Collection. Paper Presented at the UNESCO Institute of Statistic, in Anglophone Countries, Winhoek.
12. Krejcie and Morgan, (1970). Determination of sample size using table. *Kenya Projects Organization Building Capacities..*
13. **National Technical Certificate and Advance National Technical,** (2013). **Certificate Curriculum and Modules** Specialization in Vehicle MechanicsWorks, Kaduna, NBTE.
14. National Board for Technical Education (2014). **The development of national vocational qualifications framework (NVQF) for Nigeria**. A Report of the national steering committee. NBTE Press.
15. National Automotive Technicians Educational Foundation (NATEF). (2002). *Fifteenyears of progress for the National Automotive Technician Education*
16. National Automotive Technicians Educational Foundation (NATEF). (2004). *Evaluation team leader (ETL) notebook, ASE certification for medium/ heavy truck technician training programs*. NATEF, Leesburg, VA.
17. Olufumilayo, I.O. (2006). **Educational Measurement and Evaluation**. Euneeksand Associates, Gwari Road, Kaduna, Nigeria.
18. Odigiri, A.M. and Ede, E.O. (2000). Integration of New Technological Innovations in Automobiles into the Curriculum for Nigerian Technical Colleges Programmes.*Internal Journal of Vocational and Technical Education 2(5), 89- 94*

19. Oguejiofor, C. S., &Ezeabasili, C. S. (2014). Imperatives of vocational education and sustainable development in Nigeria. African Research Review, 8 (1), 42-52. doi: http://www.dx.doi.org/10.4314/afrrev.8i1.4 [CrossRef]
20. Onifade, O & Anthony, O. (2010).Integration of automobile technological developments into Nigeria technical college motor vehicle mechanics work curriculum. *8-Issue 2. Retrieved from http//:www.google.com on 13th may 2010.*
21. Tuckman, B. (1999). **Conducting educational research, 5th edition**. Belmont, CA: Wadsworth Group.
22. Usman, D.A. (2015). Human resources development needs of auto technician for effective maintenance of automobiles in Niger State. *An Unpublished M.Ed Thesis, Department of Vocational Teacher Education, University of Nigeria, Nsukka. Vocational Teacher Education, University of Nigeria, Nsukka, pp. 54-68.*
23. Wright, J, (2013, June **11).** Nurturing a new breed of car mechanic: Kids "*,who know their way around microchips as well as engine mounts have the advantage in a profession that's gaining in salary and respect.LosAngelesTimes*, p. G1.