SKILLS IMPROVEMENT NEEDS OF AUTO-ELECTRICITY TECHNICIANS FOR EFFECTIVE REPAIR OF AUTOMOBILE IN NIGER STATE, NIGERIA

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Abstract
This study was aimed at identifying skills improvement needs of auto-electricity technicians for effective repair of automobile in Niger State, Nigeria. The study made use of survey research design. The respondents consisted of 60 auto-electricity technicians. A structured questionnaire was used as the instrument for data collection. The questionnaire was subjected to face validation by three experts and was thereafter pilot-tested on 10 respondents who were not part of the population used for the study. The reliability coefficient of the instrument was calculated to be 0.81 using the Cronbach alpha formula. Two research questions and two hypotheses guided the study. Mean and standard deviation were used to answer the research question, while t-test was employed to test the hypotheses. The study revealed among others that auto-electricity technicians are deficient in skills required to carry-out repairs on automobile. Consequently, the study recommended that auto-electricity technicians should be provided with the necessary skills in those areas where they lack skills for effective repairs of automobile.

Introduction
There have been tremendous changes in modern car technology. Automobiles have changed more in the last decade than in the previous 60 years (Duffy, 1985). They now use sophisticated computer technology, advanced wiring, intricate circuitry and complex engineering. New cars and trucks are far more complex than they used to be (New York State Automobile Dealers Association (NYSADA, 2006). From 1986 to 1995, cars were equipped with first generation on-board diagnostic (OBD-1) systems. Since 1996 cars have been equipped with second generation OBD-2. An auto-mechanic, also called auto-technician, must be highly skilled in a sense-a "jack of all trades" (Duffy,

1985). Gross (2004) posited that, both technicians and owners are aware of changing technology and feel it is difficult to keep it up. Small backyard or "shade-tree mechanics" have become a fading image of the automotive past (Malone, 2006). Some car owners park their vehicles completely even when faults are minor due to technician's inability to diagnose faults because of changes and sophistication of modern automobile. Effective maintenance of today's automobile has become a major challenge to the service technician. Apparently, it is upon this (effective maintenance) that the life span of the automobile depends to a great extent. According to Narayan (2004), maintenance is a set of preventive, corrective or breakdown rectification activities.

According to Okorie (2000), if Nigeria is to benefit fully from technology, people have to be trained for jobs in the changing world of work. Occupational training is therefore, essential if Nigeria is to utilize modern technology to her advantage. Changes occasioned by technological development obviously demand a commensurable skill adjustment (Okorie, 2000). Orthodox skills have been rendered valueless, he added. Osuala (1998) defined skill as the ability to perform expertly, facilitate performance during employment. The individual is expected to use knowledge effectively and readily in the execution of his duty. It implies that in possessing a skill, there is the need to demonstrate the habit of acting, thinking and behaving in specific activity in such a way that the process becomes natural to the individual through repetition or practice.

Advances in technology has rendered electrical skills possessed by auto-electricity technicians inadequate, while creating needs for new and often sophisticated skills. This is because automobile products are coming with new devices as a result of technological advancements. With the seemingly rapid growth in motor vehicle population on Nigerian roads, there is the need to improve skills of the auto-electricity technicians. This study therefore identifies auto-electrical skill areas where auto-electricity technicians are deficient and which need improvement.

The purpose of this study was to identify the skills improvement needs of auto-electricity technicians for effective repair of automobile in Niger state. Specifically, the study determined:

- Skills improvement needed by auto-electricity technicians in the repair

of automobile electrical systems.

- Skills improvement needs of auto-electricity technicians in the use of diagnostic (On-Board/Off-Board) equipment to detect faulty automobile basic subsystems.

Research Questions

The following research questions were formulated to guide the study.

(i) What are the skills improvement needs of auto-electricity technicians in the repair of automobile electrical systems?

(ii) What are the skills improvement needs of auto-electricity technicians in the use of diagnostic (On-Board/Off-Board) equipment to detect faulty automobile basic subsystem.

Research Hypotheses

The following hypotheses relative to the study were tested at 0.05 level of significance.

(i) There is no significant difference between the mean responses of skills improvement needs of technical college graduates and trained apprentice's auto-electricity technicians in automobile electricity systems.

(ii) There is no significant difference between the mean responses of skills improvement needs of technical college graduates and trained apprentice's auto-electricity technicians in the use of diagnostic (On-Board/Off-Board) equipment to detect faulty automobile basic subsystem.

Methodology

The study adopted the survey research design. Survey is a research design that employs the study of large and small populations by selecting and studying sample chosen from the population to discover the relative incidence, distribution and interrelations of sociological and psychological variables (Olaitan, Ali, Eyoh and Sowande 2000). The population for this study consisted of all auto-electricity technicians in Minna, Niger State. Purposive random sampling technique was employed to sample 60 auto-electricity technicians. The instrument for data collection for this study was a structured questionnaire which was developed by the researcher. The questionnaire was divided into three sections A, B, and C. Section A, contained personal information. Sections B, and C contained 20 items. A 5-point Likert scale with

response categories as strongly agree (SA), Agreed (A), Undecided (UD), Disagree (DA), and Strongly disagree (SD), with assigned numerical values of 5, 4, 3, 2 and 1 respectively.

The instrument was subjected to face validation by three lecturers in Department of Industrial and Technology Education, School of Science and Science Education, Federal University of Technology, Minna. The reliability coefficient of the instrument was established using Cronbach's Alpha Reliability technique. The result of the reliability coefficient was 0.81. Copies of the questionnaire were administered to the respondents by the researcher through personal contact and with the help of two research assistants. A total number of 60 questionnaires were administered and collected. The data obtained from the study was analyzed using mean, standard deviation and t-test.

Result

Research question 1: What are the skills improvement needs of auto-electricity technicians in the repair of automobile electricity systems?

Table 1: Mean and standard deviation of responses of the skills improvement needs of auto-electricity technicians in the repair of automobile electricity systems

S/N	ITEMS	$\bar{X}$	SD	REMARKS
1.	Engine Repairs	4.26	1.13	Agreed
2.	Electronic (computer related) repairs	4.46	0.90	Agreed
3.	Routine maintenance on modern vehicles	4.23	1.29	Agreed
4.	Automatic transmission system repair	4.26	1.18	Agreed
5.	Steering geometry checks and adjustment e.g. toe-in, toe-out camber, castor.	4.20	1.10	Agreed
6.	Repair of disc and drum brakes	3.13	1.42	Undecided
7.	Repair of power steering	3.19	1.37	Undecided
8.	Repair of computer controlled injector	3.97	1.30	Agreed
9.	Resetting engine valve to maker's specification using feeler gauge and spanner.	4.23	1.29	Agreed
10.	Fuel Injection system and overhauling	3.93	1.12	Agreed

Table 1 revealed that 8 out of the 10 items have their mean score ranked above the cutoff point of 3.50 with least standard deviation of 0.90. It therefore means that auto-electricity technicians need skills improvement in all the aspects of auto-mechanic electricity system and repair work and items

6 and 7 which falls within the range of undecided.

Research Question 2: What are the skills improvement needs of auto-electricity technicians in the use diagnostic (On-Board/Off-Board) equipment to detect faulty automobile basic subsystems?

Table 2: Mean and standard deviation of responses of the skills improvement needs of auto-electricity technicians in the use of diagnostic (On-Board/Off-Board) equipment to detect faulty automobile basic subsystems

S/N	ITEMS	$\bar{X}$	SD	REMARK
1.	Use of diagnostic equipment to diagnose a faulty internal combustion engine	4.23	1.29	Agreed
2.	Use of diagnostic equipment to diagnose a faulty transmission system.	4.70	0.82	Agreed
3.	Use of diagnostic equipment to diagnose a faulty gearbox	4.62	0.86	Agreed
4.	Use of diagnostic equipment to diagnose a faulty differential Unit.	4.59	0.87	Agreed
5.	Use of diagnostic equipment to diagnose a faulty power steering	4.63	0.89	Agreed
6.	Use of diagnostic equipment to diagnose a faulty power braking system.	4.33	1.21	Agreed
7.	Use of diagnostic equipment to diagnose a faulty electrical system.	4.33	1.21	Agreed
8.	Use of diagnostic equipment to diagnose a faulty cooling system.	4.59	0.94	Agreed
9.	Use of diagnostic equipment to diagnose a faulty lubrication system.	4.51	1.11	Agreed
10.	Use of diagnostic equipment to diagnose a faulty fuel system.	4.49	0.95	Agreed

All the 10 items in Table 2 were rated above cut-off mark of 3.50 with the least standard deviation of 0.82. This revealed that auto-electricity technicians need skills improvement in the use of diagnostic (On-Board/Off-Board) equipment.

Hypothesis 1

HO_1: There is no significant difference between the mean responses of the skills improvement needs of technical college graduates and trained apprentice's auto-electricity technicians in the repair of automobile electricity systems.

Table 3: t-test analysis of the responses of the skills improvement needs of technical college graduates and trained apprentice's auto-electricity technicians in the repair of automobile electricity systems.

ITEMS	$\overline{X}_1$	SD_1	t-cal	REMARKS
Engine repairs	4.15	1.19	219	S
Emission diagnosis and repair	4.22	1.14	2.05	S
Electronics (computer-related) repairs	4.05	1.14	5.35	S
Routine maintenance on modern vehicles	4.02	1.27	3.81	S
Automatic transmission system repair	4.43	1.00	5.47	S
Steering geometry checks and adjustment.	3.97	1.23	4.44	S
Repair of skid control (anti-lock) brake unit	3.90	1.35	4.46	S
Repair of power steering	2.98	1.33	5.63	S
Repair of computer controlled carburetors	4.43	0.77	5.52	S
Fuel injection system overhauling	2.93	1.39	1.66	NS

Notation

X_1 = mean of the skills improvement needs of auto-electricity technicians in the repair of automobile electricity systems.

Sd_1 = Standard deviation of the skills improvement needs of auto-electricity technicians in the repair of automobile electricity systems.

N = 60

df = 60-2=58

t-critical = 1.67

The result above shows the opinion of auto-electricity technicians in automobile electricity system and repair work. The t-calculated values are greater than table value with exception of items 10. Therefore, the null hypothesis is rejected for other items but their opinion on the skills improvement needs in automobile repair works is the same (agreed) based on the high values of their means notwithstanding.

Hypothesis 2

HO_2: There is no significant difference between the mean responses of the skills improvement needs of technical college graduates and trained apprentice's auto-electricity technicians in the use of diagnostic (On-Board/Off-Board) equipment to detect faulty automobile basic subsystems.

Table 4: t-test analysis of the responses of the skills improvement needs of technical college graduates and trained apprentice's auto-electricity technicians in the use of diagnostic (On-Board/Off-Board) equipment to detect faulty automobile basic subsystems.

ITEMS	$\bar{X}_1$	SD_1	t-cal	REMARKS
Use of diagnostic equipment to diagnose a faulty internal combustion engine	3.31	1.32	0.15	NS
Use of diagnostic equipment to diagnose a faulty transmission system	3.85	1.25	0.00	NS
Use of diagnostic equipment to diagnose a faulty Gearbox	3.40	1.33	0.19	NS
Use of diagnostic equipment to diagnose a faulty differential Unit	4.24	0.98	0.85	NS
Use of diagnostic equipment to diagnose a faulty Power steering	3.89	1.30	0.49	NS
Use of diagnostic equipment to diagnose a faulty Power braking system	4.01	1.07	0.18	NS
Use of diagnostic equipment to diagnose a faulty electrical system	3.95	1.12	0.18	NS
Use of diagnostic equipment to diagnose a faulty cooling system.	4.24	0.98	0.85	NS
Use of diagnostic equipment to diagnose a faulty lubrication system	3.31	1.32	0.15	NS
Use of diagnostic equipment to diagnose a faulty Fuel system	4.01	1.07	0.18	NS

Notation

X_1 = mean of the skills improvement needs of auto-electricity technicians in the use of diagnostic (On-Board/Off-Board) equipment to detect faulty automobile basic subsystems.

SD_1 = standard deviation of the skills improvement needs of auto-electricity

technicians in the use of diagnostic (on-board/off-board) equipment to detect faulty automobile basic subsystems.

$N_1 = 60$
df = 60-2= 58
t-critical = 1.67

The result above revealed that t-calculated values for all the items were less than the table value. Based on this, the above stated null hypothesis is upheld for all the items. Also, it can be stated categorically that the opinion of the respondents did not differ on these items.

Discussion

Table 1 revealed that 8 out of the 10 items have their mean score ranked above 3.50 mark, with 2 items within the range of undecided and 8 items from the table recorded high degree of acceptance with mean scores above 4.00 as against the critical value of 3.50 to indicate high acceptance. The table revealed that auto-electricity technicians lack the high technical skills needed to repair modern vehicles. Okorie (2000) observed that, the orthodox skills of auto-technicians have been rendered valueless by the emergence of computer technology in modern automobiles.

The data presented in table 2, provided answers to research question two, which is on skills improvement needs of auto-electricity technicians in the use of diagnostic equipment to diagnose faulty automobile basic subsystems. Just like table 1, table 2 shows that all the 10 items registered mean scores above 4.00 also indicating a high degree of acceptance. This revealed that auto-electricity technician's needs skills improvement in the use of diagnostic equipment to diagnose automobile basic subsystem listed in the table. Schwallez (1993) observed that, the development of On-Board computers in automobiles to monitor and control performance and other mechanical systems pose greater challenges to the auto-technicians in the knowledge and skills needed for effective maintenance of the automobile.

Summary, Conclusion and Recommendations

Based on the data collected and analyzed, the following summary is made:

(i) The orthodox skills of auto-technician have been rendered valueless by the emergence of computer technology in modern automobiles.

(ii) Automobile shops lack the basic diagnostic (On-Board and Off-Board)

equipment needed for diagnosis, service and repair of modern automobiles.

(iii) Auto technicians need continuous training and retraining in automobile maintenance to keep pace with rapid changes in automobile industry.

Conclusion

Based on the findings of this study, the following conclusions are made:

(i) The introduction of electronic sensors, circuits and computers in automobiles makes it difficult, complex and more sophisticated for diagnosis, service and repair.

(ii) The orthodox skills of auto-technician have been rendered valueless by the emergence of computer technology in modern automobiles.

(iii) Auto-electricity technicians lack the high-tech skills needed to repair today's automobile.

(iv) Auto-electricity technicians lack the knowledge and skill to use diagnostic (On-Board and Off-Board) equipment for diagnosis, service and repair of modem automobiles.

(v) There is low level skills development among auto-technicians.

Recommendations

The following recommendations arc made based on findings of the study.

(i) Auto-electricity technicians should equip their workshop with modern diagnostic equipment in order to meet the challenges of maintaining today's automobile.

(ii) The government in collaboration with educational institutions should organize training programmes for auto-electricity technician.

(iii) Auto-electricity technicians should acquire the high-tech. skills needed for effective maintenance of today's automobile.

(iv) The Automobile industry should regularly organize training programmes for auto- technicians on changes or innovations in automobiles.

(v) Government should assist auto-electricity technicians with soft loans to procure modern diagnostic equipment and other equipment for their workshops.

References

Duffy, I. E. (1985). *Modern automotive mechanics.* Illinois: The Goodheart-Willcox Company.

Federal Republic of Nigeria (1998). *National policy on education,* (3rd edn). Lagos: NERDC Press.

Gross, A. (2004). *Where the jobs are: Encouraging the emerging labour force to- choose automotive service.* Retrieved on 03/6/2006. from http;www.autoinic.org.

Malone, R. (2006). *Wisconsin natural resources, magazine, auto log.* Retrieved on 21/4/ 2010, from http:www.wnrmag.com/excite/AT-wnrquery.htm

Narayan, V. (2004). *Effective Maintenance Management: Risk and Reliability Strategies for Optimizing Performance.* Retrieved on 21/4/2010, from http://www.industrialpress.com/en/htm.

New York State Automobile Dealers Association (2006). *Auto jobs.* Retrieved on 21/08/2010.

Okorie, J.U. (2000). *Developing Nigeria's workforce.* Calabar: Page Environs Publishers.

Olaitan, S.O., Ali, A., Eyoh, & Sowande. K .G., (2000). *Research skills in education and social sciences.* Onitsha: Cape Publishers.

Osuala, E. C. (1998). *Foundation of vocational education.* Nsukka: Fulladu Publishing Company.

Nice, K. (2001). *How can computer work.* Retrieved on 18/01/2003, from http://www.howslufworks.com.

Schwaller, A. E. (1993). *Motor automobile technology.* New York: Demar Publishers Inc.