ANALYSIS OF THE APPROPRIATENESS OF THE CONTENTS OF MOTOR VEHICLE MECHANICS' WORK CURRICULUM OF TECHNICAL COLLEGES IN TRAINING PROFESSIONAL MOTOR VEHICLE MECHANICS

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Abstract
*The main purpose of this study was to analyse the appropriateness of the contents of motor vehicle mechanics' work curriculum (MVMWC) of technical colleges in training professional motor vehicle mechanics. The study answered one research question and tested one null hypothesis in line with the purpose of the study. The population for the study was 465; consisting of 418 male and 38 female MVMW National Technical Certificate (*NTC*) III graduating students for the 2017/2018 session, in the 22 accredited technical colleges in North-Central States of Nigeria, together with 9 MVMW graduates of technical colleges in the area of study who are operating functional workshops. The study adopted Multi-stage Sampling Technique to select a sample size of 189 which comprised of 165 male and 15 female MVMW NTC III graduating students together with 9 MVMW graduates of technical from the area of the study who are operating functional workshops. The study utilized both quantitative and qualitative research design with focus group discussion (FGD), and questionnaire as instruments used for data collection. Cronbach Alpha (α) was used for the internal consistency of the items in the questionnaire. The reliability coefficient of the instruments yielded 0.85. The research question was answered using mean and standard deviation; while the null hypothesis was tested using t-test at 0.05 level of significance. The finding of the study revealed that the contents of the MVMWC were appropriate for training professional motor vehicle mechanics.*

Introduction

Automobiles have become the most important form of transportation across the world today. As prime movers of people and goods, they contribute daily to economic and social systems. The automobile, commonly known as motor vehicle or car, is a composite of many complex systems with sophisticated group of technologies assembled together. Malone (2006) stated that, today's cars are factory equipped with computer systems that have more intelligence than the United States' National Aeronautic and Space Administration (NASA) spacecraft sent to the moon. Automobiles now use sophisticated computer technology, advanced wiring, intricate circuitry and complex engineering (New York State Automobile Dealers Association, NYSADA, 2006). The automobile today is controlled by various electronic sensors, actuators, circuits and computers (Schwaller, 1993). Certified Master Tech. (2009) stated that, electronics control approximately 75 percent of modern automobile's operation. According to calpoly.edu/fowen/AutoMech (2012), today's car is a rolling computer; as there are 30-100 microprocessors in a car controlling various systems. These systems require routine diagnosis, maintenance and service. The maintenance of the numerous subsystems of modern automobiles has become highly challenging and expertise demanding. In spite of these challenges, Odigiri & Ede (2010) observed that the demand for automobiles in Nigeria has continued to increase, especially following the collapse of the rail transport system in the midst of undeveloped inland water ways and very high cost of air transport which is also plagued by high rates of mishaps. The resultant effect of this is high volume of work for the automobile maintenance personnel.

Automobile maintenance personnel, commonly known as motor vehicle mechanics, must therefore be equipped with the relevant knowledge, skills and the right attitude for effective maintenance of modern automobiles, owing to the influx of automobiles into Nigeria and the challenges of maintaining them. According to Schwaller (1993), one of the most important careers in the automobile industry is that of the motor vehicle mechanic. Today's motor vehicle mechanic is expected to diagnose, service and completely repair any problem in the automobile. He/she must be specially trained and equipped for on-board diagnostic (OBD-2) technology to avoid potential errors in diagnosing car trouble codes and making appropriate repairs (Malone, 2006). The motor vehicle mechanic faces the challenges of understanding each of the systems found in the automobile and the interrelationship of these systems, as well as, the need to stay current with changes as new models appear every year (Schwaller, 1993). They must understand not only the parts, nomenclature and operation, but also understand the diagnosis and service procedure for each system in the vehicle. United States Bureau of Labor Statistics (USBLS) (2012) stated that, motor vehicle mechanics must

have an increasingly broad knowledge of how vehicles' complex components work and interact. They also must be able to work with electronic diagnostic equipment and digital manuals and reference materials. According to Manitoba Advance Education and Training (MAET) in Audu, Musta'amal, Musta'amal & Inti (2014), motor vehicle mechanics also need to have: an interest in mechanical/electronic systems in motor vehicle, good problem solving ability, good vision, hearing and sense of smell, manual dexterity and mechanical aptitude, ability to communicate well in English, physical fitness and strength, ability to drive a range of vehicles, ability to read technical diagrams and illustration, have concern for safety and responsible work attitude; and in keeping up to date with technology. The above requirements, therefore, not only make the training of motor vehicle mechanics highly tasking and expertise demanding, but also require a very rich curriculum with a lot of facilities for effective and efficient implementation of the curriculum.

The term curriculum has been used with quite different meanings from its inception. This is owing to divided perceptions of stakeholders and scholars (Shao-Wen, 2012). It has been defined as, a body of knowledge to be transmitted, a product, a process, and a praxis (Smith, 2000). Foshay in Bloom (2006) defined curriculum as, all the experiences a learner has under the guidance of the school. Curriculum, to Marsh and Willis (2003), is the totality of learning experiences provided to students so that they can attain general skills and knowledge at a variety of learning sites. Curriculum, as defined by Barrow and Milburn, in Shao-Wen (2012), is an official written programme of study published by ministries or departments of education, local authorities or boards of education, and commercial firms or teams of educational specialists working on specially funded projects. Motor Vehicle Mechanics' Work Curriculum (MVMWC), in this study, is the programme in use for training motor vehicle mechanics in Nigerian formal school system for the maintenance of all types of motor vehicles.

The components of the MVMWC include: aim, objectives, contents, teaching strategies, instructional facilities, and method of evaluation. As stated earlier, the contents of MVMWC need to be rich enough to impart all the necessary skills, knowledge and attitudes required of professional/competent motor vehicle mechanic to the trainees. Curriculum contents are usually developed to hinge on the needs of the learners at any particular time; hence, the MVMWC must be designed to meet the challenges of the work place occasioned by the technological development (Ekwe & Abuka, 2014). Curriculum contents refer to the subject matter, and various topics (including skill, knowledge, attitude, among others), that help in achieving the objectives of the programmes. It is the subject matter, the professional skills, knowledge, and attitude to be learned during a programme or course (Ayeni, 1990). In this study, curriculum content refer to the various topics (including skills, knowledge, attitude, and other learning activities) that will help trainees achieve the aim and objectives of the MVMWC. Ayeni (2006) identified the following as factors influencing curriculum contents: the objectives and aims set forth for the curriculum, the state of the art of the technology at national and international level, the professional requirements, the employer requirements, the facilities available to the training institution concerned, the human resources available for the delivery of the contents to the trainees, and the curriculum document itself. The contents of the MVMWC which are designed and organised in modules for training of motor vehicle mechanics are: safety and maintenance, engine system, fuel system, cooling system, transmission and braking system, electrical systems (lighting system, ignition system), charging system, exhaust system, heating and ventilation system, steering and suspension system, lubrication system, and auto-air conditioning system (Nigerian Educational Research and Development Council, NERDC, 2009). These contents, to a great extent, determine the quality of the programme.

The quality of academic programmes in technical colleges is to be assured by National Board for Technical Education's (NBTE) curriculum development and periodic accreditation visits (NBTE, 2011). However, the incessant poor performance of motor vehicle mechanics' work students in technical colleges in the North, and the inability of products of the MVMW programme to secure gainful employment in today's automobile industry, demands a proper/independent study and analysis of the contents of the MVMWC in order to check its appropriateness in training professional motor vehicle mechanics.s

Statement of the Problem

Today's motor vehicle mechanic is expected to diagnose, service and completely repair any problem on the automobile. Furthermore, the mechanic must possess: good problem solving ability, manual dexterity and mechanical aptitude, responsible work attitude; and in keeping up to date with technology. The contents of the Motor Vehicle Mechanics Work Curriculum (MVMWC) are designed to be used for educating and training these motor vehicle mechanics for the maintenance of all types of motor vehicles in technical colleges.

Unfortunately, several studies (Odigiri & Ede, 2010; Idris, 2012; Adekunle, 2013; Inti, Latib & Rufai, 2014; Audu, Musta'amal, Musta 'amal and Inti, 2014; Udogu, 2015) have revealed that technical colleges products of the programme lacked the basic skills needed for gainful employment in today's automobile industry. Regrettably, the ineffective implementation of the contents of the MVMWC in Nigeria's technical colleges has been the bane of the programme; as graduates of the programme lacked the basic skills and the right attitude needed for gainful employment in today's automobile industry. Therefore, the problem of this study was to analyse the appropriateness of the contents of MVMWC of technical colleges in training professional motor vehicle mechanics; in order to ascertain whether the graduates' lack of skills and inability to be gainfully employed is owing to the contents of the curriculum.

Purpose of the Study

The general purpose of this study was to analyse the appropriateness of the contents of MVMWC of technical colleges in training professional motor vehicle mechanics. The study was to:

1. Determine the appropriateness of the contents of MVMWC in training professional motor vehicle mechanics.

Research Question

1. How appropriate are the contents of the MVMWC in training professional motor vehicle mechanics?

Hypothesis

The null hypothesis that guided the study was tested at 0.05 level of significance:

1. There is no significant difference between the mean responses of MVMW (NTC III) graduating students of State Government owned Technical Colleges (SGTCs) and those of Federal Science and Technical Colleges (FSTCs) on the appropriateness of the contents of MVMWC for training professional motor vehicle mechanics.

Methodology

The study adopted the descriptive survey research design. The study was carried out in North-Central Nigeria; comprising of: Kogi, Niger, Benue, Kwara, Plateau, Nassarawa and Federal Capital Territory. The population for this study was 465; consisting of 418 male and 38 female MVMW NTC III graduating students for the 2017/2018 session in the 22 accredited technical colleges in North-Central Zone of Nigeria, and 9 MVMW graduates who were operating functional workshops. The study adopted Multi-stage Sampling Technique. The subjects for the study comprised two sample groups – graduating students and graduates of MVMW. A sample size of 189 was used for the study, comprising of 165 male and 15 female MVMW NTC III graduating students, and 9 MVMW graduates who were operating functional workshops. In stage one, a purposive sampling technique was adopted to select (based on school type) two Federal Science and Technical Colleges and six State owned Technical Colleges. In stage two, a proportionate stratified random sampling technique was adopted to sample the 165 male and 15 female MVMW NTC III graduating students from the selected schools representing ratio 11:1 based on the proportion of the population of male and female. Some 9 other MVMW graduates who were operating functional workshops in the area of the study were also selected for Focus Group Discussion (FGD). The study utilised both quantitative and qualitative techniques for the purpose of enriching the findings. A structured Questionnaire titled Analysis of the Appropriateness of the Contents of Motor Vehicle Mechanics' Work Curriculum of Technical Colleges in Training Professional Motor Vehicle Mechanics; and Focus Group Discussion (FGD) were used.

The Focus Group Discussion (FGD) was conducted with nine graduates of technical colleges in the area of the study who were operating functional workshops. This was with a view to: find out from them, based on their experience on the job after school, the impact and significance of the school training on them; compare the training they received in school with workplace experience; and ascertain the quality and relevance of the school programme in training professional motor vehicle mechanics.

Method of Data Collection

A total number of 180 copies of the questionnaire were administered to the respondents by the researcher through personal contact and with the help of MVMW teachers from each of the sampled schools, who served as research assistants. The questionnaire contained 42 items, and was to determine the appropriateness of the contents of the MVMWC in training professional motor vehicle mechanics. It was structured on a five-point scale of Very Appropriate (VA), Appropriate (A), Moderately Appropriate (MA), Not Appropriate (NA), and Very Inappropriate (VI), rated 5, 4, 3, 2, and 1 respectively. Cronbach Alpha (α) reliability technique was used to establish internal consistency of the instrument. The reliability coefficient for the instrument was 0.82. Thereafter, the nine graduates selected in the area of the study who were operating functional workshops were assembled in a designated location, and the focus group discussion conducted.

Method of Data Analysis

Data collected were analysed using mean while the null hypothesis was tested using t-test. Decision for the research question was based on real limit of numbers as follows (5 Point Scale): 4.50 – 5.00 Very Appropriate, 3.50 – 4.49 Appropriate, 2.50 – 3.49 Moderately Appropriate, 1.50 – 2.49 Not Appropriate, and 0.50 – 1.49 Very Inappropriate respectively. Decision on the hypothesis was based on comparing the significant value with 0.05 level of significance. Where the significant value is less than 0.05, it was considered that, there is a significant difference, otherwise, is taken to be not significant.

Result

Research Question

How appropriate are the contents of the MVMWC for training professional motor vehicle mechanics?

Table 1:

Mean Responses of MVMW (NTC III) Graduating Students on the Appropriateness of the Contents of the MVMWC for Training Professional Motor Vehicle Mechanics

SN	Contents of the MVMWC	Mean	SD	Remarks
1	Vehicle layout	4.51	0.69	Very Appropriate
2	Auto-workshop	4.38	0.65	Appropriate
3	Safety in automobile workshop	4.36	0.56	Appropriate
4	Power unit (Engine)	4.31	0.47	Appropriate
5	Engine components	4.43	0.48	Appropriate
6	Principles of four stroke cycle (Petrol and Diesel),	4.62	0.50	Very Appropriate
7	Transmission system	4.46	0.50	Appropriate
8	Clutch assembly	4.53	0.50	Very Appropriate
9	Gear box	4.61	0.46	Very Appropriate
10	Propeller shaft	3.61	0.47	Appropriate
11	Universal joint	3.54	0.50	Appropriate
12	Rear axle assembly	3.76	0.44	Appropriate
13	Electrical fundamentals	4.43	0.48	Appropriate
14	Auto wiring system	4.44	0.47	Appropriate
15	Ignition system	4.48	0.47	Appropriate
16	Starting system	4.52	0.45	Very Appropriate
17	Vehicle fault diagnosis	4.61	0.37	Very Appropriate
18	Lighting system	4.48	0.50	Appropriate
19	Fuel supply system	4.62	0.45	Very Appropriate
20	Cooling system	4.56	0.43	Very Appropriate
21	Air cooling system	4.30	0.50	Appropriate
22	water cooling system	4.57	0.49	Very Appropriate
23	Exhaust system	4.56	0.43	Very Appropriate
24	Road wheels	4.37	0.45	Appropriate
25	Tyres	4.30	0.42	Appropriate
26	Braking system	4.62	0.47	Very Appropriate
27	Charging system	4.44	0.45	Appropriate
28	Heating and ventilation system	4.41	0.50	Appropriate
29	Air conditioning system	4.27	0.47	Appropriate

30	Safety devices and measures of safe driving	4.54	0.50	Very Appropriate
31	Factors affecting engine performance	4.27	0.50	Appropriate
32	Engine maintenance	4.77	0.44	Very Appropriate
33	Lubrication system	4.39	0.37	Appropriate
34	Valve operating mechanisms	4.39	0.50	Appropriate
35	Steering system	4.32	0.47	Appropriate
36	Steering geometry	4.36	0.50	Appropriate
37	Power Assisted Steering	4.62	0.47	Very Appropriate
38	Common steering faults	4.30	0.50	Appropriate
39	Wheel alignment	4.22	0.50	Appropriate
40	Suspension system	4.62	0.51	Very Appropriate
41	Mechatronic principles	4.26	0.50	Appropriate
42	Fluid and its properties	4.29	0.50	Appropriate
	Grand/Overall	4.49	0.48	Appropriate

The analysis of mean responses of the respondents from Table 1 revealed that 15 items were very appropriate with their mean ranging from 4.51 to 4.77; while the remaining 27 items were appropriate with their mean ranging from 3.54 to 4.48. Since the grand/overall mean is 4.49, this shows that the contents of the MVMWC are appropriate in training professional motor vehicle mechanics. Qualitative data obtained via FGD also revealed that the MVMWC was appropriate in terms of contents.

Hypothesis

t-test was used in testing the null hypothesis for the study. The analysis was done using Statistical Package for Social Sciences (SPSS). The result is hereby presented in Table 2.

Hypothesis

There is no significant difference between the mean responses of MVMW (NTC III) graduating students of States owned Technical Colleges (SGTCs) and those of Federal Science and Technical Colleges (FSTCs) on the appropriateness of the contents of MVMWC for training professional motor vehicle mechanics.

Table 2:

t-test Analysis of the Mean Responses of MVMW (NTC III) Graduating Students of States owned Technical Colleges (SGTCs) and those of Federal Science and Technical Colleges (FSTCs) on the Appropriateness of the contents of the MVMWC for Training Professional Motor Vehicle Mechanics

SN	Items	SGTCs Graduating Students N=152		FSTCs Graduating Students N= 28		t-cal	Sig.	Remarks
		X_1	SD_1	X_2	SD_2			
1	Vehicle layout	4.50	0.76	4.63	0.57	.797	.428	NS
2	Auto-workshop	4.37	0.54	4.40	0.57	-.718	.473	NS
3	Safety in automobile workshop	4.36	0.54	4.37	0.54	-.901	.216	NS
4	Power unit (Engine)	4.31	0.53	4.34	0.53	-.859	.337	NS
5	Engine components	4.43	0.53	4.45	0.54	-.802	.286	NS
6	Principles of four stroke cycle (Petrol and Diesel),	4.61	0.60	4.66	0.66	-.432	.542	NS
7	Transmission system	4.45	0.56	4.59	0.93	-.644	.433	NS
8	Clutch assembly	4.53	0.61	4.55	0.60	-.319	.905	NS
9	Gear box	4.60	0.59	4.67	0.67	-.422	.307	NS
10	Propeller shaft	3.60	0.66	3.67	0.50	-.296	.395	NS
11	Universal joint	3.52	0.72	3.78	0.44	-1.042	.065	NS
12	Rear axle assembly	3.74	0.69	3.89	0.33	-.623	.192	NS
13	Electrical fundamentals	4.43	0.49	4.45	0.49	-.123	.547	NS
14	Auto wiring system	4.43	0.79	4.60	0.52	-	.158	NS

						1.931		
15	Ignition system	4.47	0.82	4.55	0.76	-.379	.706	NS
16	Starting system	4.52	0.51	4.55	0.49	-.550	.544	NS
17	Vehicle fault diagnosis	4.60	0.60	4.67	0.66	-.442	.667	NS
18	Lighting system	4.47	0.50	4.51	0.50	-.515	.437	NS
19	Fuel supply system	4.61	0.63	4.65	0.49	-.237	.814	NS
20	Cooling system	4.55	0.65	4.60	0.68	-.281	.780	NS
21	Air cooling system	4.29	0.64	4.33	0.65	.599	.870	NS
22	water cooling system	4.55	0.65	4.70	0.57	-.896	.374	NS
23	Exhaust system	4.56	0.49	4.57	0.49	-.806	.467	NS
24	Road wheels	4.36	0.60	4.41	0.61	-.518	.654	NS
25	Tyres	4.29	0.64	4.33	0.65	-.599	.870	NS
26	Braking system	4.61	0.63	4.65	0.49	-.237	.814	NS
27	Charging system	4.44	0.50	4.46	0.49	-.764	.468	NS
28	Heating and ventilation system	4.41	0.49	4.41	0.49	.934	.675	NS
29	Air conditioning system	4.26	0.79	4.29	0.81	-.723	.525	NS
30	Safety devices and measures of safe driving	4.54	0.50	4.56	0.49	-.764	.767	NS
31	Factors affecting engine performance	4.28	0.78	4.27	0.77	.916	.318	NS
32	Engine maintenance	4.76	0.46	4.80	0.41	-.367	.715	NS
33	Lubrication system	4.39	0.49	4.41	0.48	-.846	.468	NS
34	Valve operating mechanisms	4.39	0.55	4.43	0.58	-.617	.477	NS
35	Steering system	4.31	0.49	4.35	0.49	-.459	.754	NS
36	Steering geometry	4.38	0.52	4.36	0.53	.817	.685	NS
37	Power Assisted Steering	4.61	0.63	4.65	0.49	-.237	.814	NS
38	Common steering faults	4.29	0.64	4.33	0.65	-.599	.870	NS
39	Wheel alignment	4.23	0.64	4.22	0.67	.869	.556	NS
40	Suspension system	4.61	0.63	4.65	0.49	-.237	.812	NS
41	Mechatronic principles	4.26	0.79	4.28	0.81	-.723	.523	NS
42	Fluid and its properties	4.30	0.71	4.29	0.72	.940	.474	NS
	Grand/Overall	4. 37	0.64	4.47	0.59	-.646	.523	NS

Key: X_1= Mean of SGTCs graduating students, X_2 = Mean of FSTCs graduating students; SD_1= Standard Deviation of SGTCs graduating students, SD_2= Standard Deviation of FSTCs graduating students; Degree of freedom (df) = 178; Sig= significance level (2 tailled); t t-cal= calculated values of t-test SPSS; S= significant; NS= Not Significant

Table 2 presents the t-test analysis of the mean responses of MVMW (NTC III) graduating students of State owned Technical Colleges (SGTCs) and those of Federal Science and Technical Colleges (FSTCs) on the appropriateness of the contents of the MVMWC for training professional motor vehicle mechanics. The result revealed that all the items in the table have significant value greater than 0.05. The result indicated that there is no significant difference between the mean scores of MVMW (NTC III) graduating students of State owned Technical Colleges (SGTCs) and those of Federal Science and Technical Colleges (FSTCs) on the appropriateness of the contents of the MVMWC for training professional motor vehicle mechanics. Therefore, the null hypothesis of no significant difference between the mean scores of MVMW (NTC III) graduating students of States Government own Technical Colleges (SGTCs) and those of Federal Science and Technical Colleges (FSTCs) on the appropriateness of the contents of the MVMWC for training professional motor vehicle mechanics is accepted.

Discussion of the Findings

The data presented in Table 1 provided answer to the research question, which is on the appropriateness of the contents of the MVMWC for training professional motor vehicle mechanics. Analysis of mean responses of the respondents from the Table revealed that 15 items were very appropriate while the remaining 27 items were appropriate. This shows that all the contents of the MVMWC were appropriate for training professional motor vehicle mechanics. Qualitative data

obtained via FGD also revealed that the MVMWC was appropriate in terms of contents. Discussing the importance of content in curriculum development, Ayeni (2006) posited that, aim and objectives set forth for the curriculum, among others, are the factors that influenced the curriculum contents. Furthermore, Ekwe and Abuka (2014) stated that the curriculum contents are usually developed to hinge on the needs of the learners at any particular time. Since finding of the study revealed appropriateness of the contents of the curriculum in training professional motor vehicle mechanics, the incessant poor performance of motor vehicle mechanics' work students in technical colleges in the North, and the inability of products of the MVMW programme to secure gainful employment in today's automobile industry is neither owing to nor factored on the contents of the curriculum; hence, the need for further studies to be carried out to identify the other possible factors that could be responsible for the products of the MVMW programme's lack of the basic skills, as well as their inability to secure gainful employment in today's automobile industry.

Implications of the Findings

The implication of this study is that, further studies need to be carried out, in order to ascertain the factors responsible for the poor performance of the MVMW graduates in technical colleges in North Central States of Nigeria; as well as their inability to secure gainful employment in today's automobile industry upon graduation.

Recommendation

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

1. Further studies needs to be carried out in order to ascertain the factors responsible for the inability of products of the MVMW programme to secure gainful employment in today's automobile industry
2. The government should ensure that the basic instructional facilities needed for effective implementation of the contents of the MVMWC in all the technical colleges in North Central Nigeria are provided.

Conclusion

Based on the findings of this study, it was concluded that, for graduates of technical colleges in North-Central Nigeria to acquire the basic skills and the right attitude needed for gainful employment in today's automobile industry, all hands must be on deck by all stakeholders in the MVMWC implementation, in order to identify, and address the factors responsible for the inability of products of the MVMW programme to be gainfully employed in today's automobile industry.

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