Skill Improvement Needs of Motor Vehicle Mechanics Teachers in Technical Institutions

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Abstract

The study examined the skill improvement needs of motor vehicle mechanics teachers in the use of auto scan tools in the technical institutions in Enugu state. Three research questions and three null hypotheses guided the study. The study was carried out in two technical colleges in Enugu state that offer motor vehicle mechanics (MVM) trade and three institutions where motor vehicle mechanics trade is offered as automobile technology or automobile education. A survey research design was used. The population of the study consisted of eighty (80) MVM teachers and instructors. A 36 validated item questionnaire was structured on two types of response scale (perceived importance and expressed performance) to elicit information on the use of auto scan tool for diagnosing some vehicle systems faults and its reliability coefficient was 0.79 using Pearson Product Moment correlation reliability. Data collected were analyzed using the mean and the improvement needed index (INI) to answer the research questions. The result of the study showed a minimum average improvement mean of 3.80 and a maximum of 4.31 with respect to a minimum average performance mean of 2.71 and a maximum of 4.20. Then, t- test statistic was used to test the null hypotheses at 0.05% level of significance. The study found out that MVM teachers need skill improvement in the use of auto scan tools for vehicle systems diagnosis, since the first and second null hypotheses had t-calculated as 0.26 and 0.69 respectively which are less than the t-critical of 2.05. The third hypothesis had t-calculated as 7.30 which is not less than the t-critical. The study recommended that workshop/seminars should be organized to enable MVM teachers' have skill improvement.

Key words*: skills, improvement, teacher, vehicle, auto scan-tool.*

Introduction

The effective integration of modern automotive technology (MAT) in the technical colleges will transform learning and empower students. It is important that teachers are able to successfully weave technology into learning projects. However, level of familiarity with MAT will naturally differ among teachers. The advancement of information and communication technology (ICT) begot MAT as it affects motor vehicle mechanics (MVM). Ogbuanya (2010) stated that the dynamism of every changing technology in different field of science and technology requires sound and adequate training of individual in technical education. It will be good for teachers to adapt themselves to new roles and skills in order to cope with the impending changes. The essence of the evaluation of teachers' MAT skill needs is because teachers are the primary agents of educational innovation therefore; MAT skills among MVM teachers should be seen as an invaluable prerequisite that would help facilitate MVM teaching and learning procedure in this modern age of information explosion (Oyeronke & Fagbohun, 2013). The educational infrastructure in Nigeria has been a critical element in supplying a highly qualified workforce to the automotive industry. As technology improvements in the vehicles and the manufacturing process dictate that jobs and skills change, so too must the educational offerings change as MVM teachers are expected to bring about the change. Hence vehicles of the future will require ever more sophisticated technology, changing the skills demanded of auto designers, engineers and production workers (CAR, 2011).

In automobile education, the application of autotronics systems simulation as teaching aids with computer programmable soft-wares, auto scan tools for diagnosis, servicing and maintenance, auto- analyzers, solid work design and can-bus hard wares are used for automobile learning and practice. Effective MAT professional development incorporates MVM teachers own aspirations, skills, knowledge, and understanding into the learning context. Even though it seems a complex venture but need to be surmounted because the traditional methods were put in a modern method. Thus, the gap between traditional automotive technology (TAT) and MAT can be easily closed through skill improvement and professional MVM teacher development.

Modern automotive technology (MAT) which is an output of ICT revolves round current technological advancements in motor vehicle mechanics (MVM). It is obvious that graduates of technical colleges will perform better if they are well trained in their trade areas. Most Nigerian youths are unemployed because they lack the necessary skills. Again, some MVM technicians and teachers need skill improvement in MAT.

Digital divide which refers to the widening imbalance of access to ICT's between communities and countries which created an imbalance for equitable access to quality education in an electronic age has been blamed for the denial of the potentials of ICT in creating enabling learning environment for the 21st century. Fortunately and task fully, the schools are seen as very important institutions for bridging the digital divide in society because they represent focal points where many children from different communities converge for learning purposes (Mutula and Mutula, 2007). Scholars such as Servon (2002) argued that the technology gap should not be defined narrowly as a problem of access, hence training and content, should be included as other dimensions of the digital divide so that policy makers while making policies and programs to narrow the digital divide would not lose their focus. It is therefore of paramount importance for teacher preparatory institutions to aim at developing in teachers ICT pedagogical competencies that will ensure that these teachers help the country to cross over to the positive side of the digital divide and keep pace on the information superhighway (Akudolu, 2006).

Facilities and resources such as computers, internet, auto scan tools, simulator and demonstrators are very important tools in the hands of teachers if MVM learning is to be embraced in earnest. But the question is, are the facilities at the disposal of the MVM teachers in Enugu state? If they are, are they of international standard and are the teachers utilizing the resources? Do the automobile teachers have the requisite MAT skills to impact on the students' adequately? The supply and demand of competent and skilled MVM teachers is one of the critical problems in the teaching of automobile in technical colleges. And this called for the review of the skill improvement needs of the MVM teachers. Among MVM teachers and technical colleges that offer MVM subjects, emphases should be made on how best to

acquire MAT skills needed for MVM teaching and learning in Enugu state.

The purpose of the study was to determine the skill improvement needs of motor vehicle mechanics (MVM) teachers in Enugu state. Specifically, the study determined the skill improvement needs of motor vehicle mechanics teachers in the use of:

(1) Bi-directional auto scan tool for diagnosing vehicle brake system faults.

(2) Launch code reader creader professional 123 scan tool for diagnosing engine faults.

(3) Second-generation on board diagnostic (OBD2) scan tool for vehicles emission control systems.

Research Questions

The following research questions guided the study formed the base for the research:

(1) What are the skill improvement needs of motor vehicle mechanics teachers in the use of a bi-directional auto scan tool for diagnosing vehicle brake system faults?

(2) What are the skill improvement needs of motor vehicle mechanics teachers in the use of a Launch code reader creader professional 123 scan tool in diagnosing engine faults?

(3) What are the skill improvement needs of motor vehicle mechanics teachers in the use of the second-generation on board diagnostic (OBD2) scan tool for diagnosing vehicles emission control systems?

Hypotheses

Five null hypotheses were tested in the study at 0.05 level of significance.

Ho$_1$: There is no significant difference between the mean scores of experienced and inexperienced motor vehicle mechanics (MVM) teachers on the skill improvement needs for the use of a Bi-directional auto scan tool for diagnosing vehicle brake system faults.

Ho$_2$: There is no significant difference between the mean scores of experienced and inexperienced motor vehicle mechanics (MVM) teachers on the skill improvement needs for the use of a Launch code reader creader professional 123 scan tool for diagnosing engine faults.

Ho₃: There is no significant difference between the mean scores of experienced and inexperienced motor vehicle mechanics (MVM) teachers on the skill improvement needs for the use of Second-generation on board diagnostic (OBD2) scan tool for vehicles emission control systems.

Research Method

The data collected was analyzed using mean and Improvement Needed Index (INI) to answer the research questions. Again, statistical t-test was used to test the hypotheses formulated. Skill Improvement Need (SIN) was determined as follows: the mean (XI) of the important (that is the needed) category was determined for each item; the mean (XP) of the performance category was determined for each item; the performance gap (PG) was determined by finding the difference between the two means (that is subtracting XP from XI to get PG).If PG is zero, it means that skill improvement is not needed for that item because the level at which the teachers perform the skill is equal to the level at which the skill is needed. If PG is negative

(-), it means skill improvement is not needed for that item because the level at which the teachers perform the skill is higher than the level at which it is needed. If PG is positive (+), it means skill improvement is needed because the level at which the teachers perform the skill is lower than the level at which it is needed (Olaitan et al. 2009). Also, the analysis was based on the instrument scoring weight/points. In taking decision for importance, any item with mean of 3.50 and above was considered as highly important, 2.50 - 3.49 was moderately important while any item with mean of less than 1.50 was considered as not important. In taking decision for performance, any item with mean of 3.50 and above was considered as high performance, 2.50 - 3.49 was moderate performance while any item with mean of less than 1.50 was considered as very low performance. The null hypotheses were tested at 0.05 level of significance. The decision for the null hypotheses is that if t-calculated value is less than t- critical (table) value, accept the null hypotheses but if the t- calculated is more than t-critical reject the null hypotheses. The number of automotive teachers and instructors who had used any type of auto scan tools were 51 as against 29 who had

not enough experience in the use of auto scan tools. The reliability coefficient of 0.79 was obtained using Pearson product moment coefficient. Items in tables 1 to 3 provided a check list that help to identify the skills teaches needed or not needed as remarks based on the performance gap.

Results

Research Question 1

What are the skill improvement needs of motor vehicle mechanics teachers in the use of a bi-directional auto scan tool for diagnosing vehicle brake system faults?

Table 1

Mean Ratings of motor vehicle mechanics teachers skill improvement needs in the use of a bi-directional auto scan tool for diagnosing vehicle brake system faults.

S/N	ITEMS	$\overline{X}_I$	SDI	PG	$\overline{X}_P$	SDP	REMARKS
1	Locate the bi-directional auto scan tool access point	3.93	1.27	0.03	3.90	0.46	SIN
2	Connect the bi-directional auto scan tool using the appropriate connector for the vehicle	3.45	1.25	-1.51	4.96	0.14	SINN
3	Turn on the vehicle ignition	4.05	1.18	-0.85	4.90	0.30	SINN
4	Turn on the bi-directional auto scan tool	4.02	0.93	1.12	2.90	0.14	SIN
5	Run the bi-directional auto scan tool diagnostic program	4.33	0.81	3.26	1.07	0.31	SIN
6	Navigate through vehicle brake system to access the diagnostic trouble codes from the vehicle electronic control module.	3.97	0.93	2.59	1.38	0.63	SIN
7	Record your findings for the brake system	3.66	1.08	-1.30	4.96	0.14	SINN
8	Check what the brake system code mean and see if the try fault indicated by the trouble codes need to be corrected before you clear the code.	3.67	1.63	2.60	1.07	0.31	SIN
9	Perform the repair of the brake system	4.22	1.07	-0.74	4.96	0.14	SINN
10	Select the delete code option on the bi-directional auto scan tool to clear fault code.	4.03	1.14	-0.93	4.96	0.14	SINN
11	Repeat items 3-6 to recheck and reactivate the fault code.	2.41	1.62	-2.49	4.90	0.30	SINN
12.	Turn off the bi-directional auto scan tool and disconnect from the access point.	3.96	1.36	-1.00	4.96	0.14	SINN
	Section (cluster) average mean, PG and SD	**3.80**	**1.18**	**0.78**	**3.74**	**0.26**	

Keys: *XI = mean of important (needed) category, XP = mean of performance category, PG = performance gap, SIN = skill improvement needed, SINN = skill improvement not needed, SDI = standard deviation of important category, and SDP = standard deviation of performance category.*

The data presented in table 1 showed that 5 out of 12 items had performance gap of 0.03 to 3.26 and were positive indicating that the teachers need skill improvement in five items only. Seven out of 12 items in the section or cluster have negative and zero performance gap indicating that teachers' skill improvement is not needed on those items. Generally, the teachers need skill improvement in all the items having the cluster average XI and XP as 3.80 and 3.74 respectively but less emphasizes on the 7 items with negative and zero performance gap values.

Research Question 2

What are the skill improvement needs of motor vehicle mechanics teachers in the use of a Launch code reader creader professional 123 scan tool in diagnosing engine faults?

Table 2

Mean Ratings of motor vehicle mechanics teachers skill improvement needs in the use of a Launch code reader creader professional 123 scan tool in diagnosing engine faults

S/N	ITEMS	$\overline{X}I$	SDI	PG	$\overline{X}P$	SDP	REMARKS
13	Locate the Launch code reader creader professional 123 auto scan tool access point	4.00	1.00	0.80	3.20	1.66	SIN
14	Connect the Launch code reader creader professional 123 auto scan tool using the appropriate connector for the vehicle	4.13	1.09	0.21	3.92	1.28	SIN
15	Turn on the vehicle ignition	4.61	0.70	0.65	3.96	1.54	SIN
16	Turn on the Launch code reader creader professional 123 auto scan tool	4.32	0.76	1.57	2.75	1.34	SIN
17	Run the Launch code reader creader professional 123 auto scan tool diagnostic program	2.75	1.35	-2.25	5.00	0.50	SINN
18	Navigate through vehicle engine system to access the diagnostic trouble codes from the vehicle electronic control module.	3.93	1.54	-0.82	4.75	0.55	SINN
19	Record your findings for the engine system	4.23	1.09	0.70	3.53	1.26	SIN
20	Check what the engine system code mean and see if the try fault indicated by the trouble codes need to be corrected before you clear the codes.	4.03	0.95	-0.72	4.75	0.55	SINN

21	Carryout the repair of the engine system (Adjust spark plugs to current specification, complete engine turn-up, overhaul the fuel pump, set ignition timing and clean & set contact breaker point in distributor)	3.66	0.90	-1.34	5.00	0.50	SINN
22	Select the delete code option on the Launch code reader creader professional 123 auto scan tool to clear fault code.	4.02	0.96	-0.98	5.00	0.50	SINN
23	Repeat items 3-6 to recheck and reactivate the fault code.	3.32	1.48	-1.68	5.00	0.50	SINN
24	Turn off the Launch code reader creader professional 123 auto scan tool and disconnect from the access point.	3.98	1.25	-0.20	4.18	0.50	SINN
	Section (cluster) average mean, PG and SD	**3.91**	**1.08**	**0.33**	**4.20**	**0.93**	

Keys: XI = mean of important (needed) category, XP = mean of performance category, PG = performance gap, SIN = skill improvement needed, SINN = skill improvement not needed, SDI = standard deviation of important category, and SDP = standard deviation of performance category.

The data presented in table 2 showed that 5 out of 12 items had performance gap of 0.21 to 0.80 and were positive indicating that the teachers need skill improvement in five items only. Seven out of 12 items in the section or cluster have negative and zero performance gap indicating that teachers' skill improvement is not needed on those items. Generally, the teachers need skill improvement in all the items having the cluster average XI and XP as 3.91 and 4.20 respectively but less emphasizes on the 7 items with negative and zero performance gap values.

Research Question 3

What are the skill improvement needs of motor vehicle mechanics teachers in the use of the second-generation on board diagnostic (OBD2) scan tool for diagnosing vehicles emission control systems?

Table 3
Mean Ratings of motor vehicle mechanics teachers skill improvement needs in the use of the second-generation on board diagnostic (OBD2) scan tool for diagnosing vehicles emission control systems

S/N	ITEMS	$\overline{X}_I$	SDI	PG	$\overline{X}_P$	SDP	REMARKS
25	Locate the second-generation on board diagnostic (OBD2)auto scan tool access point	4.32	0.73	1.41	2.91	0.15	SIN
26	Connect the second-generation on board diagnostic (OBD2)auto scan tool using the appropriate connector for the vehicle	3.45	1.28	2.38	1.07	0.31	SIN
27	Turn on the vehicle ignition	4.26	0.98	2.88	1.38	0.62	SIN
28	Turn on the second-generation on board diagnostic (OBD2)auto scan tool	4.18	1.07	-0.78	4.96	0.14	SINN
29	Run the second-generation on board diagnostic (OBD2)auto scan tool diagnostic program	4.71	0.76	3.64	1.07	0.31	SIN
30	Navigate through vehicle emission control system to access the diagnostic trouble codes from the vehicle electronic control module.	4.53	0.70	3.46	1.07	0.31	SIN
31	Record your findings for the emission control system	4.48	0.51	-0.48	4.96	0.14	SINN
32	Check what the emission control system code mean and see if the try fault indicated by the trouble codes need to be corrected before you clear the codes.	5.00	0.50	2.09	2.91	0.15	SIN
33	Diagnose and carryout the repair of the emission control system (full compression ratio repair and mixture combustion control)	4.22	1.08	3.13	1.09	0.30	SIN
34	Select the delete code option on the second-generation on board diagnostic (OBD2)auto scan tool to clear fault code.	4.50	0.05	-0.40	4.90	0.30	SINN
35	Repeat items 3-6 to recheck and reactivate the fault code.	3.95	1.55	2.61	1.34	0.65	SIN

36	Turn off the second-generation on board diagnostic (OBD2)auto scan tool and disconnect from the access point.	4.13	1.22	- 0.83	4.96	0.14	SINN
	Section (cluster)average mean, PG and SD	**4.31**	**0.90**	**1.59**	**2.71**	**0.29**	

Keys: XI = mean of important (needed) category, XP = mean of performance category, PG = performance gap, SIN = skill improvement needed, SINN = skill improvement not needed, SDI = standard deviation of important category, and SDP = standard deviation of performance category.

The data presented in table 3 showed that 8 out of 12 items had performance gap of 1.14 to 3.64 and were positive indicating that the teachers need skill improvement in eight items only. Four out of 12 items in the section or cluster have negative and zero performance gap indicating that teachers' skill improvement is not needed on those items. Generally, the teachers need skill improvement in all the items having the cluster average XI and XP as 4.31 and 2.71 respectively but less emphasizes on the 4 items with negative and zero performance gap values.

Testing of Hypotheses

Ho₁: There is no significant difference between the mean scores of experienced and inexperienced motor vehicle mechanics (MVM) teachers on the skill improvement needs for the use of a Bi-directional auto scan tool for diagnosing vehicle brake system faults.

The test suggested that the difference between the mean of experienced and the inexperienced MVM teachers in the use of a Bi-directional auto scan tool for diagnosing vehicle brake system faults is not statistically significant. Therefore, the null hypothesis is accepted. The t-calculated is 0.26 which is less than t-critical therefore there is no significant difference between the mean responses of experienced and the inexperienced MVM teachers in the use of a Bi-directional auto scan tool for diagnosing vehicle brake system faults.

Ho₂: There is no significant difference between the mean scores of experienced and inexperienced motor vehicle mechanics (MVM)

teachers on the skill improvement needs for the use of a Launch code reader creader professional 123 scan tool for diagnosing engine faults.

The test suggested that the difference between the mean of experienced and the inexperienced MVM teachers in the use of a Launch code reader creader professional 123 scan tool for diagnosing engine faults is not statistically significant. Therefore, the null hypothesis is accepted. The t-calculated is 0.69 which is less than t-critical therefore there is no significant difference between the mean responses of experienced and the inexperienced MVM teachers in the use of a Launch code reader creader professional 123 scan tool for diagnosing engine faults.

Ho₃: There is no significant difference between the mean scores of experienced and inexperienced motor vehicle mechanics (MVM) teachers on the skill improvement needs for the use of Second-generation on board diagnostic (OBD2) scan tool for vehicles emission control systems.

The test suggested that the difference between the mean of experienced and the

inexperienced MVM teachers in the use of a Bi-directional auto scan tool for diagnosing vehicle brake system faults is statistically significant. Therefore, the null hypothesis is rejected. The t- calculated is 7.30 which is not less than t- critical therefore there is significant difference between the mean responses of experienced and the inexperienced MVM teachers in the use of Second-generation on board diagnostic (OBD2) scan tool for vehicles emission control systems.

Discussion of the findings

The findings from tables 1 to 3 showed average clusters mean above 3.50 and indicating that respondents (experienced and inexperienced MVM teachers) agreed to a high level that there are skill improvement needs of motor vehicle mechanics teachers in the use of the auto scan tools. Tables 4 and 5 showed no significant difference between the mean responses of experienced and inexperienced MVM teachers in the use of Bi-directional auto scan tool for diagnosing vehicle brake system faults; and in the use of a Launch code reader creader professional 123 scan tool for diagnosing engine faults. Tables 6 showed significant difference between the mean responses of experienced and inexperienced MVM

teachers in the use of Second-generation on board diagnostic (OBD2) scan tool for vehicles emission control systems; Performance efficiency of the auto scan tools were not regular as a result of chance factor, sample error, non familiarity of the teachers with auto scan tools involved and code customization of auto scan tools.

The finding agreed with Abah (2011) who outlined that, lecturers in tertiary institutions in North Western states of Nigeria possessed average competencies in practical's, workshop cum classroom management and theories of automobile technology. The work recommended that seminars and workshops should be organized for lecturers of automobile technology on methods of teaching practical, effective classroom cum workshop management. The t- calculated is less than t- critical.

For MVM teachers not to be rendered valueless there is need for their skill improvement which did agree with Usman, (2007) study which revealed that the orthodox skills of auto technicians have been rendered valueless by emergence of computer technology in modern automobiles, and auto technicians lack knowledge and high technician skills needed to repair modern automobiles.

Thus, t- calculated were grater than t- critical showing significant differences.

Based on the data analyzed, the following were principal findings:

1. MVM teachers need skill improvement in the use of Bi-directional auto scan tool for diagnosing vehicle brake system faults as it concern mainly:-

Locate the auto scan tool access point, Turn on the auto scan tool, Run the auto scan tool diagnostic program, Navigate through vehicle brake system to access the diagnostic trouble codes from the vehicle electronic control module, Check what the brake system code mean and see if the try fault indicated by the trouble codes need to be corrected before you clear the codes.

2. MVM teachers need skill improvement in the use of Launch code reader creader professional 123 scan tool for diagnosing engine faults as it concern mainly:-

- Locate the auto scan tool access point
- Connect the auto scan tool using the appropriate connector for the vehicle
- Turn on the vehicle ignition
- Turn on the auto scan tool
- Record your findings for the engine system

3. MVM teachers need skill improvement in the use of Second-generation on board diagnostic (OBD2) scan tool for vehicles emission control systems faults as it concern mainly:-

    - Locate the auto scan tool access point

    - Connect the auto scan tool using the appropriate connector for the vehicle

    - Turn on the vehicle ignition

    - Run the auto scan tool diagnostic program

    - Navigate through vehicle emission control system to access the diagnostic trouble codes from the vehicle electronic control module.

    - Check what the emission control system code mean and see if the try fault indicated by the trouble codes need to be corrected before you clear the codes.

    - Diagnose and repair the emission control system (full compression ratio repair and mixture combustion control).

    - Repeat items 27-30 to recheck and reactivate the fault code.

Conclusion

Motor vehicle mechanics teachers have the need for skill improvement in the use of the following auto scan tools: Bi-directional auto scan tool for diagnosing vehicle brake system faults; Launch code reader creader professional 123 scan tool for diagnosing engine faults; Second-generation on board diagnostic (OBD2) scan tool for vehicles emission control systems, in the teaching and learning of motor vehicle mechanics in the technical colleges in Enugu state. This assertion is affirmed by the findings of the study which agreed on a general note that there is need for MVM teachers to improve in use of modern automobile technology facilities in teaching.

Recommendations

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

1. Motor vehicle mechanics departments should be well equipped with modern automobile technology facilities and competent teachers employed to man the facilities in order to enhance teaching and learning of the trade in our colleges.

2. The findings of the study should be made available to policy makers like the automobile council of Nigeria, educational institutions and other cooperate bodies/agencies of education to

enable tem effect necessary changes in the MVM programme with respect to its theories and practical's.

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