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Emergence of Professionalism in Apprenticeship system for Motor Mechanic Work in Technology and Vocational Education and Training Institution

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Abstract: This paper examined the emergence of professionalism in the apprenticeship system for motor mechanic work within the context of Technical and Vocational Education and Training (TVET) institutions in Nigeria. For decades, motor mechanic training in Nigeria has been largely informal, producing what are commonly referred to as "roadside mechanics" that operate through trial and error, lacking the scientific knowledge and modern diagnostic skills required for today's technologically advanced vehicles. The authors argue that this approach has become a financial trap for vehicle owners and a barrier to national industrial development. Drawing on the concept of work-integrated learning and degree apprenticeship models from advanced economies, the paper proposes that professionalism in motor mechanic work can only be achieved through a formalized, institution-based training system – one that mirrors the teaching hospital model used in medical education. This means training apprentices using live and dummy vehicles under the supervision of experienced professionals within an environment that replicates actual workshop conditions. A descriptive survey was conducted at Nnamdi Azikiwe University, Awka, involving 154 respondents including academic engineers, industry-based engineers, technologists, and lecturers. Using a 77-item questionnaire adapted from Hong Kong's automotive competency standards, the study found strong consensus among all respondent groups on the objectives for establishing a Service Station Mechanic Work centre. Notably, industry-based engineers showed significantly higher agreement than their academic counterparts, indicating that those working directly in the field most urgently recognise the need for change. The findings carry important implications for TVET policy in Nigeria. Unless universities and government commit to establishing properly equipped training institutes that reflect global best practices, the current cycle of unskilled mechanics causing more harm than good to modern vehicles will continue unabated. The paper concludes that professionalism in motor mechanic work is not merely desirable but essential for Nigeria to participate meaningfully in the global automotive industry.

Keywords: Professionalism, apprenticeship, motor mechanic work, TVET, roadside mechanics, institution-based training, Nigeria

INTRODUCTION

There has never been a time in history of Nigerian Technology and Vocational Education and Training (TVET) that it needed facelift of professionalism than in today's world

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where virtually everything revolves around nanotechnology orientation with precision since the emergence of Artificial intelligence tools for solving problems created by man and nature. To underplay the need for professionalism is to go back to Stone Age where trial and error approach was used to solve problems and meet needs. With respect to motor mechanic work, which is the art of diagnosing, repairing, refurbishing and/or retuning the vehicle system to serve optimally, it is important that it is given professional finesse.

Professionalism is simply the act and art of doing things empirically and satisfactorily by using well established theories. According to Ashman, Rochford, and Slade (n.d.), professionalism is synonymous to Work-Integrated Learning (WIL) while Chukwuedo and Ementa (2022) regarded it as Students' Work Placement Learning (SWPL). WIL or SWPL is the placement of students of TVET, Science or Engineering areas of study in exact environment central to the real job performance or activities either in paid, or unpaid status that integrates their vocational skills, knowledge and attitudes at the university level of education with the practice and culture of the workplace. Burgess (2025) sees it as degree apprenticeship where the apprentice is earning while learning and gaining necessary skills, knowledge and attitude within the environment ideal for the vocation.

According to Ohwojero (2023), apprenticeship has been modernized in such a way that young people undergo the training in a formalized system in such a way that medical students are trained in teaching hospital. By this, the apprentice writes down lessons at one point or the other for reference purposes. It would be recalled that medical students are taught by experienced teaching and non-teaching medical personnel in a live hospitals using patients. So also, Motor Mechanics are to be trained using life and dummy vehicle under an experienced Motor vehicle Professionals already equipped to train others within the exact environment suitable for vehicle repairs. Corroborating this, Forshaw, Ryan, and Driscoll (2023) revealed that apprenticeships are powerful learning tools, currently experiencing a revival within the U. S. just as it is escalating in entire Europe because they are using "earn-as-you learn" model to revitalize the effectiveness.

However, the earn-as-you-learn model will not work where the vital infrastructure is grossly lacking. Imagine training medical personnel or students in absence of a well-equipped teaching hospital. Career efficacy holds fort when TVET gives the participants be it students/undergraduate, graduate and or trainee the needed attitudes, values, skills in different specialties in both academic majors, up-skilling, and re-skilling within the ambience of professional set up of the trade (Chukwuedo and Odogwu, 2022) This was why Agbo and Nnajiofor (2023) maintained that highly technologically developed countries in the world invest heavily in technological innovations for the growth and development of their vocational and technologically based programmes.

Unarguably, TVET as submitted by Agbo and Nnajiofor reminded us that it is a trade-based education that is viable enough to not only curb the menace of unemployment but create jobs in different dimensions as technological booster evolves. Unfortunately, the apprenticeship system in Nigeria has been neglected beyond imagination even when it was a very viable tool for grassroots development and nursery for building capacity and workforce for effective industrialization, industrial community, employment and national development (Akande, n.d.). Going by what Agbo and Nnajiofor (2023) submitted, that a university or Nation can only be technologically developed and innovative to the point that they have progressive technology transfer between the University and industry via apprenticeship and trainee programme. This technology transfer would be from the well-developed countries to developing countries in real sense, creating World Wide Web of partnership.

The web of apprenticeship is such that learning is socially enabled in which there are connections between the experienced professional and the apprentice because it created pathways into the in-demands, well-paying work and thus increasing opportunities for people especially from under-represented groups to find expressions for their skills and talents (Forshaw, Ryan, and Driscoll, 2023). In Nigeria, a lot of TVET based groups are lagging in this pathways of gaining platform to refine their primitive skills in their chosen trades. In Motor Mechanic Work, this lacuna had given them name as "road-side mechanics" simply because they are very retarded in scientific knowledge, skills and attitudes required to actually work on modern vehicle systems. Little did they know that a prosperous, professional and marketable career in Motor Mechanics could be obtained through a formalized apprenticeship training in TVET based Institution (Sani, Adamu, Adamu, and Umar, 2021).

The formalized apprenticeship, Sani et al argued that apprenticeship is a panacea to unemployment, under employment and gateway for fresh opportunity for up-skilling, and re-skilling of massive poorly trained Motor Mechanics in the society who needs to upgrade their competency skills, knowledge and attitudes for industrial effectiveness in the use of the state-of-the-art facilities for the 21st century vehicle systems programmed with AI and internet-of-things enabled features requiring high sophistication expertise to repair (Odogwu, Obed, and Agbo 2024). This is because TVET stimulates technological and industrial development by producing competent workforce that are capable in eloping and utilizing tech-oriented tools, equipment and machines for industrial and economic development.

A situation where virtually all the Motor Mechanics in Awka metropolis and perhaps in general for example were trained in orthodox techniques of trial and error, the damage and loss are brutal. Saanyol (2020) highlighted that Nigeria's high rate of unskilled automobile mechanics has become a financial trap for vehicle owners, attributing this to the lack of scientifically-grounded training institutes. In the words of Ayantoye (2022), many of the roadside mechanics deceive clients by passing off fake spare parts as genuine, reporting false car diagnoses to swindle car owners among other sharp practices. Yusuf (2021) on the other hand noted that car maintenance business is largely informal in Nigeria with many mechanic workshops being individual standalone businesses giving room for every form of deception to scam motorists. Oluwafunmilayo (2020) further reported that seven out of ten car owners have suffered at the hands of quack mechanics. Ziblim, Nkrumah and Imoro, (2018), Olaitan (2024) and Sule, Lare and Oguntokun, (2024) submitted; that the roadsides mechanics and the current state of institution-based TVET will not attain to the global best practices until the objectives are pursued in line with the best global standard.

There had been countless gross ugly experiences of such acts in the hands of road-sides mechanics across the Nation. The question is, for how long would it take the Government or University to address these growing concerns where the more modern vehicle systems evolve, the more poorly trained Mechanics grow at the expense of the ideal situation? The argument that often erupts among Industrial Training Students who attached in road-side Mechanics for Students Work Experience Scheme (SIWES) is that University system cannot produce practical oriented graduates not minding that they actually destroys the ecosystem of vehicles due to illiteracy and poor intellectual engagement in understanding the science behind their trades, while those in the University system argue that road-side Mechanics are quacks. Thus, the need to set out the objectives for establishing formal Service Station Mechanic Work (SSMW) Training Centre became imminent. This will cover the lacuna or gulf already causing more harm than good in the TVET world.

Research Question

What are the objectives for establishing SSMW centre?

Hypothesis:

There was significant difference in the mean responses of Academic-based Engineer (ABE), Industry-based Engineer (IBE), Academic-based Technologists (ABT) and Lecturers (L) on the objectives required to establish SSMW centre.

METHODS

This study adopted a descriptive survey design (Walliman, 2011; Rahi, 2017) to develop a service station motor mechanic (SSMW) plan for automobile technology education in Nigeria. Conducted at Nnamdi Azikiwe University, Awka, the study involved 154 respondents: academic engineers, lecturers, technologists, and industry-based engineers. Total population sampling yielded 79 academic respondents; purposive sampling gave 75 industry respondents due to lack of official records (Nwana in Uzoagulu, 2011). A 77-item questionnaire, adapted from Hong Kong's automotive competency standards, was validated by experts and a roadside mechanic, achieving a Cronbach's alpha of 0.82. Data were collected via Google Forms and physical copies (107 responses, 83.5% return rate). Analysis used means, standard deviations, and ANOVA at α=0.05. The decision rule applied in this study was to reject the null hypothesis when the p-value (Sig.) was less than or equal to 0.05. Conversely, when the p-value exceeded 0.05, the null hypothesis was retained. This threshold was consistently applied in both the ANOVA and the post hoc Scheffé test to determine the statistical significance of group differences.

RESULTS

Research question 1:

What are the objectives for establishing Service Station Mechanic Work development plan?

Table 1: Mean response on the objectives for establishing service station mechanic work development plan.

S/N	Unit of Competence		Mean	*SD*	Loading	Remarks
	Vehicle Sales					
1	Implement sales plan for vehicle products	VS1	3.52	1.25	.825	Accept
2	Arrange vehicle test drive by customers	VS2	3.59	1.30	.893	Accept
3	Provide services on value assessment and trade-in of vehicles	VS3	3.67	1.32	.893	Accept
4	Handle customers' complaints	VS4	3.81	1.37	.896	Accept
5	Purchase used vehicles	VS5	3.60	1.30	.885	Accept
6	Purchase new vehicles	VS6	3.72	1.33	.920	Accept
7	Establish procedures for the receipt, dispatch and delivery of vehicles	VS7	3.85	1.34	.915	Accept
	KMO = .931; X^2 = 1085.294; df = 21; p < .000					
	New Vehicle Delivery					
8	Judge the legitimacy of vehicle usage under laws and regulations (transport, environmental protection and road safety)	NVD1	4.00	.000	Unloaded	Agree
9	Arrange receipt and delivery procedures of imported new vehicles	NVD2	3.93	1.25	Unloaded	Agree
	Vehicle Marketing					
10	Implement market research plan	VM1	3.76	1.30	.862	Accept
11	Implement marketing plans	VM2	3.70	1.26	.877	Accept
12	Exhibit / Display vehicles	VM3	3.72	1.30	.864	Accept
13	Manage customer services	VM4	4.05	1.22	.737	Accept
14	Formulate marketing plans	VM5	3.74	1.30	.873	Accept
15	Handle customers' complaints	VM6	4.07	1.24	.738	Accept

			KMO = .849; X^2 = 797.165; df =15; p < .000			
	Parts and Accessories Sales and Purchase Management (PASPM)					
16	Judge the legitimacy of vehicle usage under laws and regulations (transport, environmental protection and road safety)	PASPM1	4.62	.77	.842	Accept
17	Establish the procedures for the receipt, dispatch and delivery of parts and accessories	PASPM2	4.60	.83	.813	Accept
18	Establish and manage the documentary system for the sale of auto parts and accessories	PASPM3	4.54	.88	.886	Accept
19	Establish the procedure for the storage and retrieval of parts and accessories	PASPM4	4.51	.86	.827	Accept
			KMO = .775; X^2 = 366.872; df =6; p < .000			
	Vehicle Examination					
20	Carry out the operation guidelines on occupational safety and health	VE1	4.73	.64	.700	Accept
21	Examine vehicle of its roadworthiness	VE2	4.77	.63	.829	Accept
22	Arrange vehicle examination	VE3	4.65	.69	.889	Accept
23	Test drive and report the condition of vehicles	VE4	4.72	.68	.729	Accept
			KMO = .818; X^2 = 288.904; df =6; p < .000			
	Vehicle Examination Management (VEM)					
24	Examine vehicle of its roadworthiness	VEM1	4.78	.62	.730	Accept
25	Judge the legitimacy of vehicle usage under laws and regulations (transport, environmental protection and road safety)	VEM2	4.65	.71	.806	Accept
26	Conduct maintenance for special equipment and instruments for vehicle Inspection.	VEM3	4.72	.61	.729	Accept
27	Monitor, arrange and coordinate the progress and workflow of the operation in the workshop.	VEM4	4.71	.62	.791	Accept
28	Monitor occupational safety and health systems.	VEM5	4.62	.76	.666	Accept
30	Conduct quality check on vehicle examination.	VEM6	4.70	.65	.722	Accept
			KMO = .882; X^2 = 470.893; df =15; p < .000			
	Vehicle Exhaust Emission Examination (VEEE)					
31	Use special tools and equipment for vehicle servicing	VEEE1	4.66	.72	.852	Accept
32	Master the complicated techniques of exhaust emission control	VEEE2	4.71	.69	.859	Accept
33	Conduct quality check on vehicle examination	VEEE3	4.60	.88	.767	Accept
			KMO = .732; X^2 = 183.621; df =3; p < .000			
	Vehicle Servicing (Mechanical Services) (VMS)					
34	Identify typical dangerous chemicals and understand their characteristics	VMS1	4.71	.65	.811	Accept
35	Employ general vehicle servicing tools and equipment	VMS2	4.74	.62	.730	Accept
36	Dismantle, replace and re-assemble general vehicle system components	VMS3	4.76	.69	.676	Accept
37	Check and repair engines	VMS4	4.76	.61	.931	Accept
38	Check and repair various types of fuel supply systems	VMS5	4.71	.73	.871	Accept

39	Check and repair vehicle intelligent control systems and devices	VMS6	4.71	.72	.855	Accept
40	Conduct fault diagnosis on electric and hybrid vehicles	VMS7	4.67	.86	.654	Accept
	KMO = .885; X^2 = 812.565; df =21; p < .000					
	Vehicle Servicing (Electrical Services) (VES)					
41	Check and repair vehicle anti-theft, audio and video systems	VES1	4.70	.76	.904	Accept
42	Check and repair vehicle electronic control systems and devices	VES2	4.72	.73	.907	Accept
43	Check and repair vehicle air cooling and air-conditioning systems	VES3	4.74	.64	.577	Accept
44	Maintain various vehicle servicing tools and equipment	VES4	4.71	.66	.723	Accept
45	Conduct fault diagnosis on vehicle battery, charging and starting systems	VES5	4.70	.80	.877	Accept
46	Conduct fault diagnosis on vehicle lighting systems, signaling systems, meter instruments and displaying systems	VES6	4.65	.83	.903	Accept
47	Conduct fault diagnosis and analysis on vehicle wiper, electric door and window systems	VES7	4.66	.87	.870	Accept
48	Conduct fault diagnosis and analysis on vehicle anti-theft, audio and video Systems	VES8	4.67	.85	.847	Accept
49	Conduct fault diagnosis and analysis on vehicle electronic data control systems	VES9	4.62	.79	.842	Accept
50	Conduct fault diagnosis and analysis on vehicle air-conditioning and ventilation systems	VES10	4.60	.78	.708	Accept
	KMO = .902; X^2 =1500.286; df =45; p < .000					
	Vehicle Servicing (Body Repair) (VBS)					
51	Perform Vehicle body welding	VBS1	4.58	.86	.762	Accept
52	Dismantle and install the windows and doors as well as their components	VBS2	4.55	.91	.902	Accept
53	Check and repair front and rear windscreens	VBS3	4.51	.96	.877	Accept
54	Check and repair vehicle seats and interior fittings	VBS4	4.53	.98	.845	Accept
54	Measure vehicle body/chassis with specialized electronic instruments	VBS5	4.59	.86	.864	Accept
55	Rectify large-scale structural damages	VBS6	4.73	.69	.800	Accept
	KMO = .884; X^2 = 728.783; df =15; p < .000					
	Vehicle Repair (VR)					
56	Master complicated techniques of power systems	VR1	4.69	.70	.883	Accept
57	Master the complicated techniques of transmission systems	VR2	4.53	.87	.853	Accept
58	Monitor and manage environmental protection operations	VR3	4.64	.76	.896	Accept
59	Master the complicated techniques of chassis stability control	VR4	4.67	.72	.882	Accept
60	Master the complicated techniques of steering systems	VR5	4.63	.74	.821	Accept
61	Master the complicated techniques of suspension systems	VR6	4.65	.74	.870	Accept

62	Master the complicated techniques of electrical and electronic systems	VR7	4.62	.74	.830	Accept
63	Master the complicated techniques of alternative power systems	VR8	4.61	.80	.906	Accept
64	Master the complicated techniques of exhaust emission control	VR9	4.69	.78	.752	Accept
	KMO = .914; X^2 = 1329.607; df =36; *p* < .000					
	Vehicle Testing (VT)					
65	Examine vehicle of its roadworthiness	VT1	4.67	.73	.878	Accept
66	Monitor and maintain instruments and equipment	VT2	4.74	.61	.921	Accept
67	Conduct quality check on vehicle examination	VT3	4.72	.72	.828	Accept
	KMO = .729; X^2 = 251.785; df =3; *p* < .000					
	Repair Consultancy (RC)					
68	Manage customer services	RC1	4.63	.84	.910	Accept
69	Provide services on the repair quotation of insurance/claims for compensation	RC2	4.70	.72	.877	Accept
70	Handle customers' complaints	RC3	4.72	.61	.845	Accept
	KMO = .748; X^2 = 246.118; df =3; *p* < .000					
	Vehicle Operating Places Management (VOPM)					
71	Monitor occupational safety and health systems	VOPM1	4.60	.74	.801	Accept
72	Monitor and manage environmental protection operations	VOPM2	4.56	.88	.903	Accept
73	Establish procedures for parking, flow control and security of vehicles	VOPM3	4.54	.92	.888	Accept
74	Formulate management procedure for dangerous chemicals, pollutants and waste	VOPM4	4.66	.73	.870	
75	Investigate typical accidents at work	VOP	3.84	.57	.666	Accept
	KMO = .894; X^2 = 514.623; df =10; *p* < .000					
	Vehicle Damage Surveying (VDS)					
76	Evaluate the repair cost for accidental damages of vehicles	VDS1	4.67	.72	.923	Accept
77	Coordinate insurance claims of vehicle damages	VDS2	4.56	.91	.923	Accept
	KMO = .500; X^2 = 123.757; df =1; *p* < .000					
	Aggregate		**4.48**	**0.82**		

The aggregate mean of 4.48 revealed that respondents accepted on these objectives for establishing Service Station Mechanic Work development plan. The relatively low standard deviation ranging from (0.00 to 1.37) indicate consistent perceptions among respondents. Meanwhile it is observed that those objectives with mean ranging from 3.50 - 4.49 showed agreed while those with 4.50 - 5.0 showed strongly agreed on the objectives in view.

Hypothesis

There will be no significant difference in the mean responses of Academic based Engineer, Industry-based Engineer, Academic-based Technologists and Lecturers on the objectives for establishing Service Station Mechanic Work Centre.

Table 2 : **Descriptive statistics objectives for establishing service station motor mechanic work centre**

Job status	N	Mean	Std. Deviation
1 (Acad-based Engr)	4	4.37861	.262182
2(Ind.-based Engr.)	77	4.72586	.296741
3(Acad-based Tech)	2	3.91315	1.351173
4(Lecturers)	18	3.87662	.771044
Total	**101**	**4.54466**	**.550451**

Table 2 showed the descriptive statistics of the one-way ANOVA performed to evaluate the difference based on job status of respondents with respect to the objectives for setting up service station motor mechanic centre for functional motor mechanic work. The means and standard deviations are presented in Table 2.

Table 3: A one-way ANOVA on effect of job status on objectives for establishing service station motor mechanic centre for functional motor mechanic work

Source of variance	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	11.469	3	3.823	19.693	.000
Within Groups	18.831	97	.194		
Total	**30.300**	**100**			

Table 3 shows the one-way ANOVA conducted to determine the difference in the opinion of respondents in their job status on the objectives for setting up service station motor mechanic centre for functional motor mechanic work Results presented in Table 3 revealed a significant difference of job status on the objectives, F (3, 97) = 19.69, p = .001. Hence, a post hoc test is performed to determine where the difference lies.

Table 4: Post Hoc of Multiple Comparison Test for Research Hypothesis

(I) Job Status	(J) Job Status	Mean Difference (I-J)	Std. Error	Sig.
1	2	-.347245	.225951	.504
	3	.465463	.381574	.686
	4	.501989	.243553	.243
2	1	.347245	.225951	.504
	3	.812708	.315574	.092
	4	.849234*	.115353	.000
3	1	-.465463	.381574	.686
	2	-.812708	.315574	.092
	4	.036526	.328406	1.000
4	1	-.501989	.243553	.243
	2	-.849234*	.115353	.000
	3	-.036526	.328406	1.000

Note. 1 = Academic-based engineers, 2 = Industry-based engineers, 3 = Academic-based technologists, 4 = Lecturers.

Post hoc Scheffé comparisons showed that industry-based engineers differed significantly from Lecturers ($p < .05$), with industry-based engineers reporting higher objective scores. No other group differences were significant. This indicates that job status influences how experts perceive the objectives for functional motor mechanic work centre.

DISCUSSION AND IMPLICATIONS

The result of research question one from table 1 showed that the respondents all agreed that the objectives needed to set up Service Station Mechanic Work (SSMW) centre are very important for institution-based Training institute. Similarly, the corresponding hypothesis showed a significant effect of job status on the objectives for setting up SSMW. The industries-based Engineers reported higher objectives scores than other groups. This suggests that they support that the University should have functional motor mechanic work because the era of trial-and-error approach has gone.

The study's findings aligned with what Ziblim, Nkrumah and Imoro, (2018), Olaitan (2024) and Sule, Lare and Oguntokun, (2024) submitted; that the roadsides mechanics and the current state of institution-based TVET will not attain to the global best practices until the objectives are pursued in line with the best global standard. Otherwise, the road side mechanics and the trade-based TVET institution will not make desired impacts on the leaners while on the part of motorists, they keep causing more harm than good.

The finding that respondents across all job statuses affirmed the programme objectives, with Industry-Based Engineers demonstrating significantly higher agreement, implies that those actively engaged in the field recognize that meaningful training cannot occur unless global best practices are adequately integrated into the programme. Charles Prosser's first three vocational theorems provide succinct insight into this perspective. They posit that the efficiency of training objectives is directly proportional to how faithfully the learning environment replicates the actual workplace, utilizing the same operations, tools, and machines found in the occupation itself. Furthermore, effective training must directly and specifically cultivate the thinking habits and manipulative skills required in the profession. Therefore, if University management intends to derive maximum benefit from the programme, addressing the fundamental issue of establishing a dedicated training institute is sacrosanct.

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