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Assessing the Internal Consistency of Process Rating Scale for Fault Diagnoses and Repairs in Diesel Engine Maintenance Practice in Technical and Vocational Institutions in Bayelsa State, Nigeria

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Abstract: The study focused on the internal consistency of developed test for assessing technical vocational education and training students in motor vehicle mechanic work: diesel engine maintenance. The study adopted instrumentation design. It was carried out in Bayelsa State, Nigeria. The population of the study comprises of 64 motor vehicle mechanic work students. The instrument for data collection was the process skill rating scale test items consist of 45 (items) in service station mechanic work and diesel engine maintenance, they were found to be appropriate and internally consistent for inclusion. These items were developed using a task analysis questionnaire and were rated and validated by 3 experts in the study area. Cronbach alpha reliability coefficient was used to determine the internal consistency of the instrument. The internal consistency reliability coefficient is 0.87 and 0.88, with an overall index of 0.88 indicating a very high reliability, thus making them to be appropriate for inclusion for practical skills test. Mean scores were used to answer the research question, with ratings of 3.5 and above considered suitable for inclusion with Criterion value of ($r \geq 0.30$). The findings revealed that all the developed service station mechanic work and diesel engine maintenance process skill rating scale instrument, possessed high reliability coefficients when considered using both the pairing and the grouping of the assessors using Kendall coefficient of concordance Tau (W). Thus, none of the items in each of the programme was dropped. Based on the findings, it was therefore recommended that the examination bodies in charge of conducting examinations for the vocational and technical colleges such as NBTE and NABTEB should integrate the process skill test items in their examination for certification of students in motor vehicle mechanic work at NTC level. It was also recommended that the developed process skill rating scale test items should be adopted by the National Examination Council (NECO) and West African Examination Council (WAEC) as a means of assessing motor vehicle mechanic work/ automobile technology for Nigerian institutions.

Keywords: Practical Skills, Motor Vehicle Mechanic Work, Technical and Vocational Education and Test

INTRODUCTION

The design of a practical skills assessment instrument plays a critical role in improving students' performance by clearly identifying the competencies to be assessed and ensuring consistency in evaluation. According to (Poripo, 2026) and Poripo et al. (2016), the development of an assessment instrument requires careful attention to internal consistency to ensure that it accurately measures the intended skills. Effective assessment instruments help reduce the waste of time, effort, and resources by ensuring that graduates possess the practical

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competencies required by employers. Ogbozor (2006) described assessment instrument design as the process of creating tools for evaluating students' performance in practical tasks. Similarly, White and Ahmadi (2003) emphasized that developing a valid instrument involves reviewing existing tools, identifying relevant domains and items, defining response categories, establishing reliability and validity, and preparing supporting assessment materials.

Practical skills refer to organized and observable activities performed while carrying out vocational and technical tasks (Poripo, 2026, Poripo, 2024 and Poripo et al., 2016). These skills are acquired through hands-on experiences that enable learners to develop occupational competencies (Bartel, 2006). Practical skills as the abilities required to perform specific jobs effectively (Umo-Otong, 2000). In Technical Vocational Education and Training (TVET), these competencies are assessed through students' performance in practical activities (Poripo, 2026 and Poripo, 2025). Technical colleges in Nigeria provide technical and vocational education aimed at producing middle-level skilled manpower for national economic and technological development. Their objectives include providing technical knowledge and vocational skills, preparing graduates for employment or self-employment, and equipping them for further education in Polytechnics, Colleges of Education (Technical), and Universities (FRN, 2014). To achieve these goals, TVET programmes are offered across technical colleges (Poripo, 2026 and Poripo, 2024). One of these programmes is the National Technical Certificate (NTC) in Motor Vehicle Mechanic Work (MVMW), which is designed to produce skilled technicians capable of diagnosing and repairing motor vehicle faults (Poripo, 2025; Poripo et al., 2020; NABTEB, 2004). MVMW focuses on the scientific knowledge and practical skills related to vehicle design, construction, operation, maintenance, and repair (Poripo, 2026, Poripo, 2024; Poripo et al., 2024). It is a vocational programme that prepares learners for employment in the automotive industry. At the technical college level, the programme covers Service Station Mechanics Work, Engine Maintenance and Refurbishing, and Auto Electricity (Ariola, 2016), (Erjavec, 2010), and (Doyin, 2004). MVMW primary objective is to produce competent craftsmen who can contribute to Nigeria's industrial and technological development (Aruku, 2007).

The programme aims to enable graduates to test, diagnose, service, and repair vehicle systems according to manufacturers' specifications (Poripo & Youdiowei, 2014; NBTE, 2001). Consequently, teachers are expected to provide students with both theoretical knowledge and practical skills that support employment and entrepreneurship (Abdulkadir & Olaitan, 2011). Achieving these objectives requires appropriate assessment instruments. A test instrument is a structured tool used to measure learners' performance and generate scores from which meaningful conclusions can be drawn (Gall et al., 2007). Test instruments as systematic procedures for measuring learners' knowledge, skills, and behaviours (Okeke, 2003), (Ogwo and Oranu, 2006). In Motor Vehicle Mechanic Work, assessment instruments should evaluate not only theoretical understanding but also practical competence.

Because MVMW is a skill-oriented programme, performance tests are considered more appropriate than conventional written examinations for assessing psychomotor skills (Okoro, 2002). According to Ogwo and Oranu (2006), performance tests require learners to demonstrate practical operations under workplace-like conditions. Oranu (2000) and Ezeji (2004) emphasized that competence in technical education is best assessed through practical demonstrations and process skill ratings. Similarly, Effiong (2006) and Amuka (2002) highlighted the importance of observing and rating learners' step-by-step procedures during practical tasks. Process skill test instruments consist of structured practical activities designed to evaluate learners' ability to perform observable tasks (Poripo, 2026, Poripo et al., 2016; Ombugus, 2014; Olaitan, 2011).

The process skill instruments assess curriculum-based competencies under conditions similar to real workplace environments (Crowder, 2010), (Okwelle and Okoye, 2012), (Okwelle and Okeke, 2012). Since practical skills cannot be adequately measured through written examinations alone (Olaitan & Ali, 1999), there is a need for reliable and internally consistent process skill rating scales. Such instruments would provide a more valid assessment of students' competencies in Motor Vehicle Mechanic Work, particularly in diesel engine maintenance. To be effective, these instruments must possess sound psychometric properties, including reliability, validity, and the ability to distinguish between high-, average-, and low-performing learners (Gall & Borg, 2007). This need underscores the importance of developing a dependable process skill rating scale for assessing practical competencies in Motor Vehicle Mechanic Work.

Statement of the Problem

The assessment of practical skills is essential to ensuring that students in technical and vocational institutions acquire the competencies required for diesel engine maintenance. During fault diagnosis and repair, students are expected to follow standard procedures accurately and demonstrate the necessary technical skills. Process rating scale instruments are commonly used to evaluate these practical activities. However, the usefulness of these instruments depends on their ability to consistently measure the skills they are intended to assess. In many technical and vocational institutions in Bayelsa State, practical assessments are often affected by differences in assessors' judgments, unclear rating criteria, and inconsistencies in the design of assessment instruments. As a result, students with similar levels of practical competence may receive different scores, raising concerns about the internal consistency and reliability of the process rating scale instruments used for assessment.

When an assessment instrument lacks internal consistency, the results may not accurately reflect students' actual competencies. This can lead to incorrect decisions about students' practical abilities and may affect the quality of graduates produced by the institutions. Despite the importance of reliable assessment instruments, there is limited empirical evidence on the internal consistency of process rating scale instruments used in assessing fault diagnosis and repair skills in diesel engine maintenance practice in technical and vocational institutions in Bayelsa State, Nigeria. It is against this background that this study seeks to assess the internal consistency of the process rating scale instrument used for fault diagnosis and repairs in diesel engine maintenance practice in technical and vocational institutions in Bayelsa State, Nigeria. The findings are expected to provide evidence on the reliability of the instrument and contribute to improving the quality and credibility of practical skills assessment.

Purpose of the Study

The purpose of the study is to develop and validate process skill rating scale instrument items for assessing student practical skills in motor vehicle mechanic work fault diagnoses and repairs in the technical colleges in South-South, Nigeria. Specifically, the study seeks to determine:

1. the internal consistency of the process rating scale in motor vehicle mechanic work fault diagnoses and repairs in service station mechanic work maintenance.
2. the internal consistency of the process rating scale in motor vehicle mechanic work fault diagnoses and repairs in diesel engine maintenance.

Research Question

The study was guided by the following research questions:

1. What is the internal consistency of the process rating scale in motor vehicle mechanic work fault diagnoses and repairs in service station mechanic work?

2. What is the internal consistency of the process rating scale in motor vehicle mechanic work fault diagnoses and repairs in diesel engine maintenance?

METHODOLOGY

This study adopted an instrumentation research design, which focuses on developing and validating an instrument for measuring specific skills or behaviours. The design was considered appropriate because the study aimed to develop an instrument for assessing the practical skills of students in Motor Vehicle Mechanic Work (MVMW). The study was carried out in Bayelsa State, Nigeria, where three technical colleges offer Motor Vehicle Mechanic Work programmes. The state was selected because of its concentration of automobile workshops, after-sales service industries, and manufacturing firms that provide employment opportunities for graduates in the field. The population consisted of 64 final-year National Technical Certificate (NTC III) students from the three colleges. Since the population was small and manageable, all students participated in the study. Data were collected using the Process Skill Rating Scale in Motor Vehicle Mechanic Work (PSRSMVMW), developed from the National Technical Certificate curriculum. The instrument contained items rated on a four-point scale: Excellent (4), Good (3), Fair (2), and Poor (1). Face and content validity of the instrument was carried out by five experts who validated the instrument, while its reliability was determined using Cronbach's Alpha, which produced a coefficient of 0.87 and 0.88, with an overall index of 0.88 indicating a very high internal consistency of the items. The researcher personally administered and retrieved the instrument after familiarizing students with the assessment procedures. Mean scores were used to answer the research question, with ratings of 3.5 and above considered suitable for inclusion with Criterion value of ($r \geq 0.30$).

RESULTS

Research Question 1: What is the internal consistency of the Process Rating Scale in motor vehicle mechanic work fault diagnoses and repairs in service station mechanic work?

Table 1: Assessors' Pearson Product Moment Correlation on Students' Performance on Service Station Mechanic Work

Task/ Cluster	AB	AC	AD	BC	BD	CD	No. of Clusters Meeting Criterion ($r \geq 0.30$)	Remarks
1	0.12	0.41	0.57	0.10	0.65	0.37	4	Qualified and Reliable
2	0.50	0.66	0.08	0.41	0.82	0.64	5	Qualified and Reliable
3	0.71	0.27	0.35	0.59	0.54	0.49	5	Qualified and Reliable
4	0.84	0.74	0.87	0.78	0.58	0.24	5	Qualified and Reliable
5	0.49	0.22	0.38	0.35	0.49	0.78	5	Qualified and Reliable
6	0.25	0.61	0.51	0.58	0.69	0.62	5	Qualified and Reliable
7	0.36	0.72	0.48	0.50	0.49	0.38	6	Qualified and Reliable
8	0.71	0.71	0.90	0.76	0.48	0.76	6	Qualified and Reliable
9	0.58	0.58	0.33	0.50	0.58	0.58	6	Qualified and Reliable
10	0.49	0.64	0.81	0.43	0.58	0.58	6	Qualified and Reliable
11	0.86	0.72	0.82	0.67	0.85	0.79	6	Qualified and Reliable
12	0.75	0.84	0.79	0.51	0.86	0.66	6	Qualified and Reliable
13	0.57	0.74	0.58	0.45	0.37	0.56	6	Qualified and Reliable
14	0.53	0.87	0.73	0.64	0.54	0.73	6	Qualified and Reliable
15	0.74	0.83	0.76	0.87	1.00	0.87	6	Qualified and Reliable
16	0.81	0.30	0.55	0.50	0.45	0.48	6	Qualified and Reliable
17	1.00	1.00	1.00	1.00	1.00	1.00	6	Qualified and Reliable

Key: Q = Qualified/Reliable for inclusion in the final copy of the Process skill rating scale

The data presented in Table 1 above revealed that 11 task cluster (64.70 percent) out of 17 task clusters had all the 6 pairs with r- values of 0.30 and above,5 task cluster (29.0 percent) out of 17 task cluster had all the 5 pairs with r- values of 0.30 and 4task clusters (23.5 percent) out of 17 task cluster had all the 4 pairs with r- values of 0.30 and above. This means that all the 17 task clusters in Service station mechanic work were reliable and so satisfied the criteria for selection of the items to be inclusion in the final copy of the process skill rating scale.

Research Question 2: What is the internal consistency of the process rating scale in motor vehicle mechanic work fault diagnoses and repairs in diesel engine maintenance work?

Table 2: Assessors' Pearson Product Moment Correlation on Students' Performance on Diesel Engine Maintenance Work

Task/ Cluster	AB	AC	AD	BC	BD	CD	No. of Clusters Meeting Criterion (r ≥ 0.30)	Remarks
1	0.61	0.21	0.61	0.12	0.67	0.17	3	Qualified and Reliable
2	0.34	0.67	0.00	0.35	0.00	0.00	3	Qualified and Reliable
3	0.48	0.11	0.41	0.17	0.27	0.67	3	Qualified and Reliable
4	0.25	0.28	0.50	0.07	0.69	0.56	3	Qualified and Reliable
5	0.47	0.13	0.05	0.52	0.46	0.31	4	Qualified and Reliable
6	0.82	0.29	0.18	0.53	0.34	0.32	4	Qualified and Reliable
7	0.18	0.20	0.65	0.68	0.63	0.57	5	Qualified and Reliable
8	0.22	0.22	0.69	0.47	0.00	0.67	5	Qualified and Reliable
9	0.80	0.71	0.75	0.75	0.22	0.89	5	Qualified and Reliable
10	0.50	0.44	0.44	0.57	0.57	1.00	6	Qualified and Reliable
11	0.71	0.68	0.63	0.71	0.67	0.88	6	Qualified and Reliable
12	0.83	0.78	0.78	0.91	0.74	0.67	6	Qualified and Reliable
13	0.80	0.71	0.75	0.75	0.73	0.89	6	Qualified and Reliable

Key: Q = Qualified/Reliable for inclusion in the final copy of the Process skill rating scale

The data presented in Table 2 above revealed that 4 task cluster (30.7 percent) out of 13 task clusters had all the 6 pairs with r- values of 0.30 and above, 3 task cluster (20.3 percent) out of 13 task clusters had all the 5 pairs with r- values of 0.30 and 2 task clusters (15.3 percent) out of 13 task cluster had all the 4 pairs with r- values of 0.30 and above while,4 task clusters (30.7 percent) out of 13 task cluster had all the 3 pairs with r- values of 0.30 and above. This means that all the 13 task clusters in diesel engine maintenance work were reliable and so satisfied the criteria for selection of the items to be inclusion in the final copy of the process skill rating scale.

DISCUSSION

The degree of agreement or coefficient of concordance among the assessors on their judgment per item within each task cluster was computed using Kendall Coefficient of Concordance Tau (W). The degree of agreement or coefficient of concordance among the raters on the test scorings was therefore computed. The inter rater reliability of the 4 raters were found to be 0.557, 0.707, and 0.868 for raters 1 and 2; 2 and 3; 3 and 4 respectively for service station mechanic work; 0.707, 0.792, and 0.873 for raters 1 and 2; 2 and 3; 3 and 4 respectively

for diesel engine maintenance work ;0.843, 0.796, and 0.548 for raters 1 and 2; 2 and 3; 3 and 4 respectively for auto electricity/electronics work. These values were in agreement with the recommendation by Poripo, (2026) and Poripo, et al, (2016), Cohen et al (2011) and (Olaitan, 2011) that a coefficient ranging from 0.51 to 1.00 indicate high degree of agreement between 2 or more examiners. Based on the results of the analysis, all the developed process skill rating scale test, possessed high reliability coefficients when considered using both the pairing and the grouping of the assessors using Kendall coefficient of concordance Tau (W). Thus, none of the items in each of the programme was dropped.

CONCLUSION

Motor Vehicle Mechanic Work aims to develop learners' technical knowledge and practical skills for employment and self-reliance. However, the current assessment system focuses mainly on theoretical knowledge and does not adequately measure students' practical competencies. Consequently, many graduates may not acquire the hands-on skills required in the workplace. The developed process skill test items provide a valid and reliable means of assessing students' practical abilities. Therefore, the process skill rating scale can be effectively used to evaluate the practical competencies of NTC students and serves as a better alternative to assessment methods that primarily measure cognitive achievement rather than actual job skills.

RECOMMENDATIONS

Based on the findings from the study, the following recommendations are made:

1. The examination bodies in charge of conducting and organizing examinations for the technical colleges (NABTEB) should integrate the process skill test items in their examination for certification of student in motor vehicle mechanic work at ANTC/NTC levels.
2. The developed process skill rating scale and the process skill test items in motor vehicle mechanic work can be adopted by the West African Examination Council (WAEC) and National Examination Council (NECO) as a means of assessing motor vehicle mechanic work/ automobile technology which happens to be one of the newly introduced 32 trade programmes for Nigerian secondary schools.
3. The process skill rating scale test items should be used by the teachers in motor vehicle mechanic work at the NTC level to assess the student during teaching and at the terminal assessment of their student.
4. The developed process skill test items in motor vehicle mechanic work should be subjected to further try outs by the teachers in order to serve as a means of further assuring its efficacy, practical usefulness and eventual adoption for the assessment of practical skill acquisition in motor vehicle mechanic work at the NTC level.

REFERENCES

Abdulkadir, M. & Olaitan, O. O. (2011). The role of improvisation in the effective teaching and learning of motor vehicle mechanics work at technical college level. *Journal of Science, Technology, Mathematics and Education (JOSTMED)*. 7(3), 278-286.

Ali, A. (2006). *Conducting Research in Education and the Social Sciences*. Enugu: Tachiwa Network. Ltd.

Aruku, A. S. (2007). The Relevance of Motor Mechanics Curriculum to the Entrepreneurial Needs of Motor Mechanic Graduates of Technical Colleges in Enugu State. *Unpublished M.Ed. Thesis*. University of Nigeria, Nssuka.

Baker, F. B. (2005). *The Basics of Item Response Theory.* Retrieved December 14, 2010 from http://www.info.worldbank.org/etools/docs/library/117765/itempercent20responsepercent2 0theorypercent20-percent20fpercent20baker.pdf.

Burkar, B. (2006). *Development and Validation of Laboratory-Based test for Assessing Practical Skills of Higher National Diploma Student in Electronic Maintenance and Repairs.* Unpublished Ph.D Thesis, University of Nigeria, Nsukka.

Chiejile, L. C. (2006). *Development and validation of a test instrument for assessing students' practical performance in electrical installations*. Unpublished doctorial dissertation, Nnamdi Azikiwe university, Awka, Anambra State.

Cohen, L., Manion, L., & Morrision, K. (2009). *Research Methods in Education6/e.* New York: Routldge Taylor & Francis.

Cohen, L., Manion, L., Morrison, K., Bell, R.,Martin, S., McCcllock, G. & Sullivan, O. C . (2011). *Research Methods in Education 7/e*. New York: Routldge Taylor & Francis.

Doyin, O. O. (2004). *Strategies for Improving the Teaching and Learning of Motor Vehicle Mechanic Trade in Some Selected Technical Colleges in Osun State.* Unpublished B.Ed (Tech) Project. Kaduna Polytechnic, Kaduna.

Effiong, E. J. (2006). *Development and Validation of Alternative to Practical Tests for Measurement Skills in Electronic Devices and Circuits on Technical Colleges* Unpublished Ph.D Thesis, University of Nigeria, Nsukka.

Erjavec, J (2010). *Automotive Technology: A Systems Approach. 5/e* United Kingdom: Delmar Cengage Learning.

Erjavec, J. (2004). *Automotive Technology: A system Approach 3/e* Singapore: Thomas Delmar Learning.

Ezeji, S.C.O.A. (2004). *Basic Principles of Research in Education*. Enugu: Cheston Agency Ltd.

Fatunsin, L. O. (1996). *Development and Standardization of Performance-based test for Assessing Students Performance in Agriculture in Secondary Schools in Ondo State.* Unpublished Ph.D. Thesis, University of Nigeria, Nsukka.

Federal Republic of Nigeria, (2014). *National Policy on Education*. Lagos: Federal Ministry of Education, Printing Press.

Gall, M. D.,Gall, J. P., & Borg, W. R (2007). *Educational research: An introduction 8/**e.*** New York: Pearson Education Inc.

Garba, L. N. (1993). *Development of an instrument for evaluating practical project in woodwork*. Unpublished doctorial dissertation, University of Nigeria, Nsukka, Enugu State.

Garba, N. L. (1994). Evaluating Student's Practical Projects in Technology Education. *Spectrum Journal*, 2,1 & 2.

Gronlund, N. E. (1993). *How to make Achievement tests and Assessments.5/e* New York. Allyn and Bacon.

Huitt, W. (2009). Bloom et al.'s taxonomy of the cognitive domain. *Educational Psychology Interactive*. Valdosta, G. A: Valdosta State University.

Igbo, C. A. (1997). Development and Validation of Psycho-productive Skill Test for Assessing Senior Secondary School Students in Clothing and Textile Unpublished Ph.D Thesis**.** University of Nigeria, Nsukka.

Kendall, M. G. (1975). *Rank Correlation Methods. London and High Combe: Charles Graffin & Company Ltd.*

Lindquist, R. (1998). Quality Improvement of Teachers and Learning in Higher Education: A Comparison with Development in Industrial Setting. *Teaching in Higher Education* 3(1), *51-56.*

NBTE (2003). *Motor vehicle mechanics work-national technical certificate (NTC) and advanced national technical certificate (ANTC).* national board for technical education. National Technical Certificate.

NBTE. (2001). *National technical certificate and advanced national technical certificate curriculum and module specifications in motor vehicle mechanic work.* kaduna: national board for technical education. Retrieved on September 25, 2009 from http://www.unesco.unesco.org/images/001613/161378e.pdf.

NBTE: National Board for Technical Education (2001). *National technical certificate programme in mechanical engineering craft practices curriculum*. Kaduna: NBTE.

Nwana, O. C. (2007). *Textbook on Educational Measurement and Evaluation.* Owerri: Bomaway Publishers.

Nworgu, B. G. (2003). *Educational Measurement and Evaluation: Theory and Practice.* Nsukka: University Trust Publishers.

Nworgu, B. G. (2006). *Educational Research: Basic Issues and Methodology. Ibadan:* Wisdom Publishers Ltd.

Odu, E. N. & Ihejiamaizu, E. C. (2001). *Statistics and Basic Methods in Education and Social Sciences*. Calabar: University of Calabar Press.

Odu, O. K. (2001). Development and Validation of an Instrument for assessing students Psycho-performance in Block laying and concreting. *Unpublished Ph.D. Thesis*. University of Nigerian, Nsukka.

Offorma, G. C. (2002). *Curriculum Theory and Planning*. Enugu: Family Circle Publications.

Ogbazi, N. J. (2001). *Theories of vocational development and choice. In SCOA Ezeji (Ed). Guidance and counseling in education. Nsukka, Nigeria: Chulbson International Press.*

Ogwo, B. A. (2004). Functionality vocational education in Nigeria public schools: Examining some Policy Paradigms. In Uzodimma, C. U (Ed), *Functionality of Education in Nigeria: Issues, Problems and Concer*n. Enugu. The Academic Forum for the Inter-Disciplinary Discuss (TAFID).

Ogwo, B. A., & Oranu, R. N. (2006). *Methodology in Formal and Non-Formal Technical Education and Vocational Education.* Enugu: Ijejas Printing and Publishing Co.

Okoro, O. M. (1999). *Principles and methods in vocational and technical education.* Enugu: ABIC Publishers.

Okoro, O. M. (2000). *Programme Evaluation in Education*. Obosi: Pacific Publishers Ltd.

Okoro, O. M. (2002). *Measurement and Evaluation in Education.* Obosi: Pacific Publisher Ltd.

Okoro, O. M. (1993). *Principles and Methods in Vocational and Technical Education*. Nsukka: University Trust Publishers.

Okpala, P. N., Onocha, C. O., & Oyedeji, O. A (1993*). Measurement and Evaluation in Education*. Ibadan: Stirling-Horden Publishers.

Okwelle, P. C & Okeke, B. (2012). Development and Validation of Instrument for Assessing Practical Skills in Fault Diagnoses and Repair of Radio and Television systems in Nigerian Technical Colleges. *American Journal of Scientific and Industrial Research. AJSIR.*181-190.

Okwelle, P. C. (2011). *Development and validation of instrument for assessing practical skills in radio and television systems in technical colleges*. Unpublished doctoral dissertation, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

Okwelle, P. C & Okoye, K. R. E. (2012). Development and Validation of Instrument for Assessing Practical Skills in Building Electronics Systems in Nigerian Technical Colleges. *Journal of Emerging Trends in Engineering and Applied Sciences. JETEAS* 3 (5), 779-785.

Olaitan, O. O. (2014). Development and validation of tests for assessing student`s skills in motor vehicle mechanic work for technical colleges. *Unpublished Ph.D Thesis.* Department of Vocational Teacher Education, University of Nigeria, Nsukka.

Olaitan, S. O. (1996). *Vocational and Technical Education in Nigeria: Issues and Analysis.* Onitsha: Noble Graphic Press.

Olaitan, S. O. (2003). *Understanding Curriculum*. Nsukka: Ndudim Press.

Olaitan, S. O., & Ali, A. (1999). *The Making of Curriculum: Theory, Process, and Product, and Evaluation*. Owerri: Cape Publishers Ltd.

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

Olayinka, O. (2010). *Integration of Automobile Technological Developments into Nigeria Technical College Motor Vehicle Mechanics Work Curriculum. Academic Leadership online journal. 8(2)*.

Ombugus, D. A. (2014). Development and Validation of Workshop-based Process Skill Tests in Mechanical Engineeri ng Craft for Assessing Students in Technical Colleges in Nasarawa State, Nigeria. *Unpublished Ph.D Thesis*. Department of Vocational Teacher Education. University of Nigeria, Nsukka.

Onyilofe, M. P. (2008). Development and Validation of Criterion-Referenced Tests for Assessing Student Performance in Petrol Engine Maintenance in Technical Colleges. *Unpublished ME.D Thesis.* Department of Vocational Teacher Education.University of Nigeria, Nsukka.

Oranu, R. N. (2003). Vocational and Technical Education in Nigeria. Retrieved on 16th April 2011 from http://www.ibe.unesco.org/curriculfum/Africapdf/Lago2.ora.Pdf.

Poripo, J. (2026). Development and validation of a process skill rating scale for assessing practical competencies in motor vehicle mechanic work in technical colleges in Bayelsa State, Nigeria. *Journal of Research in Industrial Technology & Educational Studies (JRITES), 2 (Issue 2),* 82-92.

Poripo, J. (2025). Emerging workshop competencies needed for establishing automobile enterprises by motor vehicle mechanics in fuel and ignition systems maintenance in Bayelsa State, Nigeria. *Industrial Technology Education Research Journal (ITERJ).* 8(1), *189-198.*

Poripo, J. (2025). Effect of job crafting intervention on job demands resources among metalwork technologists in technical and vocational institutions in Bayelsa State, Nigeria. *International Journal of Entrepreneurship, Skills and Innovation*.1(Issue 1), *37-48.*

Poripo, J. (2025). Needs driven research in automobile engineering and technology for sustainable industrial and national development in Bayelsa State, Nigeria. *NAU Journal of Technology and Vocational Education,* 10 (2), *97-104.*

Poripo, J. (2025). Impact of artificial intelligence (AI) in the teaching and learning of skill-based education in TVET institutions in Bayelsa State, Nigeria. *Journal of Centre for Technical Vocational Education, Training and Research (JOCETVETAR),* 7(1), *120-131.*

Poripo, J. (2024). Impact of vocational facilities in the teaching and learning of vocational and technical subjects in vocational institutions in Bayelsa State, Nigeria*. International Journal of Tourism and Technology.* 2 (1), *1-9.*

Poripo, J. (2024). Effect of age on the level of stress experienced and academic performance of automobile technology students exposed to multiple stress management interventions in universities in Southern Nigeria. *Sagbama Journal of Science and Technology Education (SAJOSTE),* 2 (1), *70-79.*

Poripo, J. (2024). Mental health status and academic performance of automobile technology students in universities in South-South, Nigeria. *Sagbama Journal of Science and Technology Education (SAJOSTE),* 2 (1), *17-24.*

Poripo, J. (2023). Impact of multiple stress management intervention on motivation and academic performance of automobile technology education students in universities in South-South, Nigeria. *Sagbama Journal of Science and Technical Education,* 1 (2), *46-54.*

Poripo, J., Ede, E. O., Nwoado, S. I. & Youdiowei, B. T. (2020). Effect of multiple stress management intervention on stress and academic performance of automobile technology education students in universities in South-South, Nigeria. *Journal of Engineering and Applied Sciences,* 15 (Issue 9), *2121-2127.*

Poripo, J., Youdiowei, B. T. & Okardi, B. C. (2016). Development of instrument for assessing students practical skills in fault diagnosis and repairs of motor vehicles in technical colleges, Bayelsa State, Nigeria. *Journal of Issues in Professional Teacher Education,* 11 (2), *130-149.*

Poripo, J. & Uwauzi, K. K. (2015). Effective utilization of ict for rebranding technical education programmes in tertiary institutions in South-South, Nigeria *for* Economic Development. *Journal of Social Sciences and Development. 1(5), 138-149.*

Poripo, J. & Youdiowei, B. T. (2013**).** Assessment of the adequacy of instructional facilities used for vocation and technical education, South-South Nigeria. *Journal of Issues in Professional Teacher Education. 6(2), 80-94.*

Poripo, J. & Youdiowei, B. T. (2014). Assessment of utilization of instructional facilities in the teaching and learning of automobile technology in tertiary institutions in South-South Nigeria. *Journal of Vocational education and Technology. 11(1&2),77-90.*

Poripo, J. *&* Youdiowei, B. T. (2015**).** Technical skill improvement needs of metalwork technology teachers for entrepreneurship development in Bayelsa State*. Journal of Vocational Education and Technology, 12 (1),* 8-20.

Uzoagulu, A. E. (2011). *Practical guide to writing research projects in tertiary institution*. Enugu: John Jacobs Classic Publishers.

Youdiowei, B. T. & Poripo, J**.** (2013). Students Participation in Decision Making and their Attitudinal Disposition toward the Management of Technical Colleges in Rivers State. *Journal of Issues in Professional Teacher Education. 6(2),* 63-79*.*

Youdiowei, B. T. & Poripo, J. (2015). workshop management competencies improvement needs of auto-mechanics teachers of technical colleges in the South –South, Nigeria for economic development*. Journal of Vocational Education and Technology. 12(1),* 33-42.

Youdiowei, B. T., Poripo, J. & Uwauzi, K. K. (2022). Human resources management skills required by technical education administrators for sustainable development in Niger Delta Region of Nigeria. *Sagbama Journal of Science and Technical Education, 1 (1),* 82-92.