International Journal of Research (IJR)

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Vol. 10 Issue 06
June 2023

# Development and Validation of Practical Skills Rating Instruments for Technical College Students in Nigeria

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## Abstract

*This study was designed specifically with the major purpose of developing and validating an instrument for rating students' practical skill performance in trades in technical colleges. The study answered five research questions and tested two hypotheses. Practical skills from the National Technical Certificate (NTC) curriculum were identified for which test items were generated. The population for the study comprises 276 teachers in technical colleges. Mean, Grand Mean, Standard Deviation, Cronbach Alpha, ANOVA and Scheffe's Multiple Range test were employed for analysis of data. Results of the data analysis showed that twenty two items of the developed practical skill rating instrument were adjudged suitable to be used for assessing students practical skill performance in technical colleges. The instrument was satisfactorily valid as it possessed a high content and face validity. The reliability of the whole instrument was found to be 0.89 and adjudged reliable. Recommendations were made.*

Keywords: Validation, Practical Skill, Rating Instrument, Technical Colleges

***Received***: *02 May 2023*
***Revised***: *21 May 2023*
***Final Accepted***: *02 June 2023*

DOI: https://doi.org/10.5281/zenodo.7996750

International Journal of Research (IJR)
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## INTRODUCTION

### Background to the study

Practical work has been widely used in technical college workshops as a method of teaching technical subjects. Practical work makes learning easy, more comprehensive and real, more involving and students driven. It is know that the purpose of practical work is to develop and test students' practical skills. More so practical work involves students' skill, knowledge and attitude towards tools, materials, machinery and safe use of them (Okeke, 2016).

The Federal Government of Nigeria laid great emphasis on practical work in technical education (FGN, 2018), that is the acquisition of skill and capability to produce. In other to satisfy this requirement, the focus on technical education has been to train and impact necessary skills leading to the production of skilled craftsmen and personnel who will be enterprising self-reliant and intelligent to understand the increasing complexity of technology (FGN, 2018).

Technical colleges are regarded as the principal vocational institution in Nigeria. They offer full vocational training intended to prepare students for entry into various occupations. They train craftsmen in auto mechanics, plumbing, carpentry, and joinery, cabinet making, painting and decoration, wielding, electrical installation, radio and television repairs among others. At the end of the approved period of study, technical college students are offered with Federal. Craft Certificate (FTC) and National Technical Certificate (NTC). some technical colleges also offer advanced craft courses of one year duration, which leads to the Advanced National Technical Certificate (ANTC).

Practical work is offered at both intermediate and advanced levels in technical colleges. The curriculum of technical college practical work in addition to what may be termed the general education include subjects as mathematics, English Language, Physics, Chemistry, Social Studies has the core trade subjects such as automobile, building, electrical/electronic, metalwork, woodwork etc.. Products of technical colleges may choose to proceed to the university, polytechnic or colleges of education for further studies, otherwise the product may join the labour market where they contribute to the technological development of the country by repairing mechanical machinery, fabricating tools, engine spare parts, constructing domestic and agricultural machineries, demonstrating good entrepreneurship skills, providing maintenance services automobile repairs and working in industries.

In the effort to promote practical work throughout the country and increase the quality of the graduates of technical colleges, Towe (2015) noted that the National Bard for Technical Education (NBTE) reviewed the existing curricula and developed new curricula to enhance the flexibility in the production of skilled technician at all levels and to train students to acquire

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practical skills required for their physical wellbeing, national growth and technological development.

When students are engaged in practical work to produce things either individually or in groups, some measures of assessment must be carried out to determine the learning outcome in their practical work. The teacher, is therefore challenged to find ways of awarding valid marks for work done. Okeke (2018) observed that teachers assess practical work by merely taking a cursory look at them and then assigning any grade they thought the students deserved. No serious effort appears to have been made in evaluating the quality or characteristics of individual students' practical work by at least preparing a definite procedure of evaluation. The need therefore, arose to develop and validate an instrument to measure students' practical skills, which they have acquired in the course of their training with the right instrument in place, the teacher can be confident in the quality of their teaching, and employers can have confidence on qualified candidates. Nworgu (2015) noted that any educational decision about the students certainly have far-reaching implication on the students overall development and progress. The school personnel who are charged with the responsibility of such decision will therefore, need to ensure that the quality of the data on which decision are to be based are valid and reliable. The quality of the obtained data is a function of the quality of the instrument with which they are generated. Educationist must involve the use of valid and reliable instruments whose psychometric properties are satisfactory (Ikeoji 2016). Standard instruments are constructed by experts and such instruments have specific traits which they are designed to measure. The instrument should have specific conditions under which their administration, scoring and grading procedure must follow. They are also designed for specific class, level or age. Such instruments are usually pre-tested for some reasons, such as timing, validity, reliability and effectiveness of each test item (Ikeoji, 2016).

United Nations Educational Scientific and Cultural Organization (UNESCO, 2022) reported that the results of evaluations are used for decision about selection, placement, promotion and certification and because of the importance of these actions, extra attention must be paid to the quality of the measurement, including their validity and reliability. Evaluation of students' performance is often times skewed to the cognitive aspect of students learning to the neglect. of the practical skills, attitudes and values, which students must have acquired during the period of training. Evaluating practical skills in technical college is an important aspect of the teaching tasks, perhaps, the most vital of all the teaching and learning processes in technical colleges (Gallington, 2017).

Okeke (2022) found that instruments for assessing practical skills in technical colleges were very few. The reason according to him was that most teachers in technical colleges lack the knowledge and skill in instrument development. Wolansky (2015) also revealed that manipulative skill test was designed to measure and analyze students' skill performance on selected operations

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***Revised***: *21 May 2023*
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or procedures under rigidly controlled conditions, and are time consuming to prepare and administer. He further stressed that such test tended to limit the number of students to be tested at the same time. The most appropriate test for assessing technical college students for practical skills would be test of competence in the skills they acquired (Okeke, 2019). This implies that the best means of assessment of students' practical skill performance is through manipulative skill test in order to measure the learning outcomes in their practical work. Wolansky (2015) observed that teachers could develop evaluation instruments just as they were required to plan and implement instruction.

Practical work is an integral part of the National Technical Certificate (NTC) curriculum. Other core courses in the trade includes: foundry and forging, machine shop practice, graphics, mechanical engineering drawing; technical drawing and introduction to metal work technology The curriculum is made up of 60 percent theory and 40 percent practical Work. The aim of this initiative is to increase the technological growth of the country (FGN, 2018). In spite of the federal government emphasis on improving technology, teachers appear to find it difficult to assess their students' practical skills. According to Harbor-Ibeaja and Nworgu (2020), secondary school teachers do not seem to possess enough competence in instrument development and validation. Amike (2020) identified inadequate competence as a problem of technical college teachers to develop instruments in their trade areas. With invalid and unreliable testing instruments; wrong decisions regarding the students do occur and would adversely affect their future learning.

Technical college teachers need dependable and accurate assessment instrument to test students' competencies in practical work in order to make wise decisions regarding their students. practical work in the technical college curriculum involves the skills required in accomplishing given tasks.

The assessing teachers can determine their students' performance based on the instrument developed. Adequate evaluation instrument has not been developed and validated for assessing the practical skill performance of technical college students.

**Statement of problem**

Practical work has been widely used in technical college workshops as a method of teaching technical subjects. When students are engaged in practical works to produce things either individually or in group some measures of assessment must be carried out to ensure the learning outcomes in their practical work. The teachers are then called upon to realize the need for coming up with ways and means through which valid marks could be awarded.

Most teachers evaluate students' practical work by merely taking a cursory look at them and then assigning any grade they thought the student deserved. No serious effort appears to have been made in evaluating the quality or characteristics of individuals' practical work by at least

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preparing a definite procedure of evaluation Okeke (2016). Quite recently, students passed the WAEC technical and National Business and Technical Examination (NABTEB)in flying colours without adequate evidence that they possessed the required occupational skill. The students were awarded high grades while their performance on the given practical work was poor (Uwadiae, 2022). This implies that teachers may have been relying on incorrect data generated with faulty instrument. In some other cases, students were unsatisfied with the marks awarded to them by their teachers because the assigned grades or marks seemed not to reflect the quality of workmanship of their projects. With invalid and unreliable testing instruments; wrong decisions regarding the students' do occur and would adversely affect their future learning. The only option is to develop a valid and reliable instrument to test students' practical skills, which they have acquired in the course of the learning. With the right instrument, the students can be confident in the quality of the training and teachers can have confidence in the trained students.

All (2020) stressed the need for technical college teachers to develop and use valid and reliable instrument for assessing students' practical skill performance. Most technical college teachers lack the competence in instrument development and validation (Nworgu, 2015). There is need to develop valid and reliable testing instrument for teachers to use in assessing their students in various trade areas like welding craft, auto mechanics, plumbing, carpentry and joinery, cabinet making, painting and decoration, electrical installation among others. Practical work as modulus in the NBTE curriculum in Nigeria lack adequate evaluation instrument for the measurement of students' practical skill. The problem of the study, therefore, is what are the considerations for developing and validating technical college students' practical skill rating instrument?

**Purpose of the Study**

The purpose of the study was to develop and validate a rating instrument for assessing students' practical skill performance. Specifically, the study sought to:

1. Identify the practical operations inherent in technical college trades.
2. Determine the suitability of the items for assessing students' practical skill performance in technical trade operations.
3. Determine the content validity of the Practical Skill Rating Instrument (PSRI).
4. Establish the reliability of the Practical Skill Rating Instrument (PSRI).
5. Determine. the guidelines for using the Practical Skill Rating Instrument (PSRI).

**Significance of the Study**

The benefits that shall accrue from this study are many, specifically curriculum planners, teachers and students will benefit from the result of this study

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The findings of the study would make meaningful contributions towards technical education in general and the field of technical college trades in particular. Curriculum planners would use the information in planning viable and quality technical education programme to qualify students for entry into chosen occupations and or higher education.

The findings of the study will also provide an option to the traditional teacher-centered evaluation method, where teachers rate or access students' practical work without a definite procedure The findings of this study will be useful to technical college teachers in that they would now have an instrument, which will be used to evaluate technical college students' practical.

More so, the items that will be incorporated for use in the present instrument would enable teachers assess the abilities of students to perform to specified standards. Therefore, the result obtained through the use of the instrument, would enable teachers identify areas in which the students perform poorly so that improvements could be made in future.

The findings of this study will also be beneficial to the students in the sense that the evaluation of the technical college students practical will be based on the same standard and the use of the instrument by technical college teachers would make students to have confidence in the validity of their teacher grading. Technical college students can also know when they have achieved a required level of mastery or have met industry standard The learner can be confident in the quality of their training and employers can have confidence on qualified students.

It is also hoped that the outcome of the study shall enable the students of technical colleges to redirect their priorities in the practice of acquiring skills for future employment; so that when the desirable type of craftsman is moulded in the technical college graduate, he would be gainfully employed, reducing both unemployment and poverty. This can be achieved by a conscientious practice of the skills in the instrument developed. Again, the government may become aware of the necessary areas to direct attention for the overall manpower development.

## Research Questions

The following research questions guided this study:

1. What are the practical operations inherent in technical college trades?
2. What is the suitability of the items for assessing 'students' practical skill performance in trades in technical college?
3. How valid is the technical college practical skills rating instrument?
4. How reliable is the technical college practical skills rating instrument?
5. What are the guidelines for using the technical college practical skill rating instrument in assessing students' practical skill performance?

## Hypotheses

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***Revised***: *21 May 2023*
***Final Accepted***: *02 June 2023*

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The following hypotheses were formulated and tested at 0.05 level of significance.

HO1: there is no significance difference in the mean scores of teachers of various qualifications regarding the practical operations in technical college trades

HO2: there is no significance difference in the mean scores of teachers with respect to qualifications on the suitability of the items for assessing students' practical skill performance.

**Delimitation of the study**

The study is restricted to technical colleges in the three educational zones, out of the nine zones of the NABTEB zoning system of the country The three zones are made up of Delta, Edo, Ondo, Ekiti, Rivers, Imo, Anambra, Enugu, Abia, Ebonyi, Osun, Oyo, Lagos and Ogun State.

## RESEARCH METHOD

This chapter discussed the design of the study, area of the study, population of the study, sample and sampling technique, instrument for data collection, validation of the instrument, reliability of instrument, method of data collection and method of data analysis.

**Design of the Study**

An instrumentation research design was used for the study. The reason for using this design is that it is appropriate for use when introducing new standard instruments for educational practices (Ali, 1990 and Odu 2002).

**Area of the Study**

The study was conducted in three out of the nine zones of the NABTEB Zones in the country. These are zones one, four and five. Zone one is made up of Edo, delta, Ondo Ekiti and Rivers States, zone four comprises of Osun, Oyo and Ogun States and zone five is made up of Imo, Anambra, Abia, Enugu and Ebonyi States (NABTEB. 2018). The reason for using the three zones is that no adequate studies. on Instrumental Development have been done in these zones (Olisa. 2018). In addition, the educational awareness and interest of the people is considered to be relatively high when compared with the other six zones.

**Population of the Study**

The target population comprise all technical college trade teachers in Delta, Edo Ondo, Ekiti, Rivers, Imo, Anambra, Enugu, Abia, Ebonyi, Osun, Oyo, Lagos and Ondo states technical colleges with Bachelor degree in Industrial Technical Education or Higher National Diploma /Post

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graduate Diploma in Education or Full Technology Certificate/Technical Teacher Certificate. The population was 276 teachers (NBTE, 2018).

**Sample and Sampling Techniques**

The entire population of 276 technical College trade teachers was used for the study, thus there was no need for sampling.

**Instrument for Data Collection**

The Practical Skill Rating Instrument was designed for assessing students; practical skill in Technical College trades.

To develop the instrument, the following stages that are characteristics of instrumentation research were followed.

Identification of practical skill areas in NTC trade curriculum Development of the table of specification

Writing out of the items.

Development of a rating scale for assessing practical skill

Validation of Instrument

Experts rating of instrument for reliability

Analysis of item qualities

Preliminary selection of items

Try-out of Instrument V

Final selection of items

In selecting the operations, the researcher considered the various sections of practical activities in Technical College trade curriculum.

The table of specification was structured in line with the performance objectives of the curriculum of technical college trades, The Practical Skill Rating Instrument was made up of two sections and structured in line with the research questions and hypotheses of the study.

Section A is designated for Academic Qualifications of Teachers (AQT). These consist of B.Sc. Industrial Technical education, HND/PGDE- and Full Technology Certificate/TCC.

Section B is made up of practical operations, responses of the teachers were made in the instrument by checking (√) in items of the extent of practical kill performance of each student.

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**Validation of the Instrument**

The instrument used for data collection were face validated by four Technology Education experts in the Department of Vocational and Adult Education, Nnamdi Azikiwe University, Awka and three Measurement and Evaluation experts in the Department of Educational Foundation, Delta State University, Abraka. Face validation is considered very important because according to Borg and Gall (2019), it is the evaluators' appraisal of what the content of the instrument purports to measure. The experts, were requested to do the following:

i. Review and revise the item where necessary
ii. Review/delete/add items as they considered of the instrument.
iii. Make general comments on the usability of the instrument

For content validity the experts ensure that the instrument covered the practical skill areas of trades in the NTC curriculum and the Harrow's (2017). The experts input formed the basis for the final draft of the instrument used for the study. As part of the validation procedure, the instrument draft were sent out to 276 technical college teachers in the three NABTEB Zones who examined the items in respect of the appropriateness for inclusion in the final instrument, and the accepted test items validated by the experts.

**Reliability of the Instrument**

The researcher administered the instrument under practical examination condition to 24 students of technical colleges randomly selected from two of the technical colleges in Delta State, 12 students each from Government Technical College, Isselel-Uku and Government Technical College, Agbor on the entire items developed for the instrument.

Data from the administrations were correlated using Cronbach Alpha Correction Coefficient.

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**Method of Data Collection**

The distribution of the instrument were done by personal contact of the researcher and assistants. The validated instrument were used further on all the technical college students in Delta, Edo, Ekilit, Ondo, Rivers, Imo, Anambra, Enugu, Abia, Ebonyi, Osun, Oyo, Lagos and Ogun States. The schools concerned were approached by the researcher to obtain permission to use both the students and facilities of the schools The necessary materials, tools and machines for each operation were acquired and made available in the respective schools.

Responses of the technical colleges trade teachers will be made in the instrument by checking (√) in terms of extent of practical skill performance of each student. The raters were advised about the negative influence of some sources of errors in rating such as error of central tendency, severity error, and generosity error etc.

**Method of Date Analysis**

The mean rating of the experts were computed. The items will be rated by the experts (raters) about their suitability for inclusion into the final instrument. Item with mean rating of 4.50 and above were regarded as very suitable, items with mean rating of 3.50-4.49 were regarded as suitable, items with mean rating of 2.50-3,49 were regarded as moderately suitable, items with means rating of 1.50-2.49 were regarded as fairly suitable while items with ratings of 1.00-1.49 were regarded as not suitable. Items with, mean rating of 3.50 and above were selected for the instrument. The Cronbach Alpha (8) coefficient, was used to test the degree of reliability of the instrument. Guidelines for the administration, scoring and interpretation of the WCPSRI will be determined.

The two null hypotheses were tested at 0.05 level of significance using one-way analysis of variance (ANOVA). The Scheffe's multiples Range test was used to locate which of the group mean among the population is significant from the others.

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**Results:**

**Research Question 1**

Teachers' rating of the practical skills that are inherent in the technical college trades

| S/N | Practical Skills | Grand Mean | Standard Deviation | Remarks | Reliability Coefficient Table |
|---|---|---|---|---|---|
| 1 | Auto body repair | 3.63 | 0.12 | Suitable | 0.86 |
| 2 | Auto body spray painting | 3.71 | 0.11 | Suitable | 0.77 |
| 3 | Auto electrical repair | 3.84 | 0.14 | Suitable | 0.67 |
| 4 | Auto mechanical repair | 3.80 | 0.13 | Suitable | 0.86 |
| 5 | Auto parts merchandizing | 3.62 | 0.17 | Suitable | 0.81 |
| 6 | Block laying | 3.86 | 0.11 | Suitable | 0.79 |
| 7 | Interlocking stone laying | 3.66 | 0.13 | Suitable | 0.66 |
| 8 | Concreting | 3.51 | 0.14 | Suitable | 0.71 |
| 9 | Building construction | 3.53 | 0.17 | Suitable | 0.83 |
| 10 | Carpentry | 3.60 | 0.13 | Suitable | 0.90 |
| 11 | Joinery | 3.64 | 0.12 | Suitable | 0.89 |
| 12 | Electrical installation | 3.57 | 0.14 | Suitable | 0.84 |
| 13 | Electrical maintenance | 3.51 | 0.11 | Suitable | 0.87 |
| 14 | Furniture making | 3.63 | 0.12 | Suitable | 0.62 |
| 15 | GSM phone maintenance and repairs | 3.72 | 0.15 | Suitable | 0.71 |
| 16 | Machine woodworking | 3.69 | 0.13 | Suitable | 0.77 |
| 17 | Metalwork machines operation | 3.81 | 0.14 | Suitable | 0.87 |
| 18 | Painting and decorating | 3.56 | 0.16 | Suitable | 0.87 |
| 19 | Radio, television and electronic repair | 3.63 | 0.17 | Suitable | 0.83 |
| 20 | Refrigeration and air conditioning repair | 3.71 | 0.13 | Suitable | 0.66 |
| 21 | POP ceiling | 3.62 | 0.15 | Suitable | 0.86 |
| 22 | Welding and fabrication | 3.86 | 0.16 | Suitable | 0.67 |

The analysis presented in table 1 showed that the grand mean score of the raters ranged from 3.51-3.84. the highest grand mean score was 3.84 while the lowest was 3.51. All the practical skills obtained scored grand mean of 3.50 and above and were adjudged suitable to be used for developing practical skill rating instrument for technical college trades. The decision to use items with the cut-off point of 3.50 and above was determined by finding the class boundary between the lower limit and upper limit of the numbers in every response category.

**Research question 2**

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***Revised***: *21 May 2023*
***Final Accepted***: *02 June 2023*

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**Table 2**

**Teachers' rating of the suitability of practical skills rating instrument for technical college trades**

| S/N | Practical Skills | Grand Mean | Standard Deviation | Remarks | Reliability Coefficient Table |
|---|---|---|---|---|---|
| 1 | Trouble shooting skill | 3.73 | 0.12 | Suitable | 0.76 |
| 2 | Diagnosis skill | 3.61 | 0.11 | Suitable | 0.77 |
| 3 | Problem solving skill | 3.64 | 0.13 | Suitable | 0.77 |
| 4 | Safety measures | 3.70 | 0.13 | Suitable | 0.76 |
| 5 | Use of relevant machines, tools, equipment | 3.62 | 0.15 | Suitable | 0.61 |
| 6 | Repair skill | 3.76 | 0.11 | Suitable | 0.69 |
| 7 | Service skill | 3.56 | 0.13 | Suitable | 0.76 |
| 8 | Maintenance skill | 3.52 | 0.14 | Suitable | 0.61 |
| 9 | Time management skill | 3.73 | 0.12 | Suitable | 0.63 |
| 10 | Cutting skill | 3.60 | 0.13 | Suitable | 0.60 |
| 11 | Measuring skill | 3.54 | 0.12 | Suitable | 0.79 |
| 12 | Technical Skill | 3.67 | 0.14 | Suitable | 0.74 |
| 13 | Material Selection skill | 3.51 | 0.11 | Suitable | 0.57 |
| 14 | Finishing Skill | 3.73 | 0.12 | Suitable | 0.62 |
| 15 | Teamwork and Collaboration | 3.72 | 0.13 | Suitable | 0.71 |
| 16 | Aesthetic Skill | 3.69 | 0.13 | Suitable | 0.77 |
| 17 | Creativity | 3.80 | 0.14 | Suitable | 0.77 |
| 18 | Customer Service skill | 3.66 | 0.13 | Suitable | 0.67 |
| 19 | Installation skill | 3.63 | 0.17 | Suitable | 0.63 |
| 20 | Assembling skill | 3.71 | 0.13 | Suitable | 0.66 |
| 21 | Technical Drawing skill | 3.72 | 0.15 | Suitable | 0.76 |
| 22 | Innovation skill | 3.76 | 0.13 | Suitable | 0.67 |

The analysis presented in table 2 showed that the grand mean score of the raters ranged from 3.52 -3.80. The highest grand mean score was 3.80 while the lowest was 3.52. All the practical skills rating items obtained scored grand mean of 3.50 and above and were adjudged suitable to be used as practical skill rating instrument for technical college trades. The decision to use items with the

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cut-off point of 3.50 and above was determined by finding the class boundary between the lower limit and upper limit of the numbers in every response category.

**Research question 3**

In order to answer this question, the content and face validity of the items were determined. The procedure involved identifying the practical skill areas in technical college trades. The items were submitted to four experts in technology education and the experts in measurement and evaluation who reviewed the appropriateness of the face validity of the items. The experts reviewed, revised the 22 items constructed for the instrument, they also reworked some items and made satisfactory comments about the entire instrument.

**Research question 4**

In order to answer this question, Cronbach's (alpha) () was computed for the various items of the instrument. The reliability coefficients of the instrument WAS 0.78

Reliability estimate (Cronbach Alpha) for practical skills rating instrument for technical college trades

The result of the analysis indicates that each item had a high reliability coefficient ranging from 0.62-0.90. Also, the reliability coefficient of the entire instrument was computed to be 0.78, which indicated that the rating instrument was in consonance with acceptable reliability of critically refined instrument which ranged from 0.80 to 0.95. Given the high reliability coefficient, the answer to the research question about the reliability of the instrument would be in the affirmative.

**Research question 5**

What are the guidelines for using the Practical Skill Rating Instrument for technical college trades?

In order to answer this question, the following guideline was provided. The Practical Skill Rating Instrument is specially designed for welding technical college teachers, the rationale being that for any individual to use the instrument, he/she must have more than general knowledge and practical skill at the technical college level. The users should have practiced these operations several times in the workshops for the purpose of understanding the instrument, its administration, scoring and interpretation patterns.

The instrument should be used to measure the degree of skill demonstrated by final year technical college students in the workshops. The instrument is, therefore, used for process evaluation purposes. The administration of the instrument hould be done by technical college teachers who

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have obtained Bachelor degree in Industrial Technical Education or Higher National Diploma in Mechanical Technology/Post Graduate Diploma in Education or Full Technology Certificate/Technical Teacher's Certificate to ensure a better assessment on the students' practical skills performance in the trade operations. Observation of the students by the raters and the administration of the instrument should take place in the trade workshop.. Scoring of the instrument is quiet simple. The total scores for the instrument on each student's performance is 5x22 = 110 points where 5 points (excellent), is the highest point obtainable per item and 22 is the total number of items in instrument. The student scores were converted into percentage thus:

Students' scores in the test items all over 110 x 100 Scoring was done by calculating the students' scores on all the items over the total points multiplied by 100 percent. Students who attain the specific skill measured on each item by the raters earn five points. The students who perform the skills to very near perfection earn four points and this scoring procedure goes down until one point.

For interpretation of results, students who have scores of 70 Percent and above, should be awarded A which is excellent; students who score between 60-69 percent should be awarded B which is Good; students who have scores between 50-59 percent should be awarded C, which is fair, students who scores between 40-49 percent should be awarded D, which is pass while students who have scores between 0-39 percent should be awarded F which is fail.

**Hypothesis 1**

There is no significant difference in the mean scores of teachers of various qualifications regarding the practical operations in technical college trades using ANOVA.

The analyzed data for hypothesis I is presented in Table 4

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***Revised***: *21 May 2023*
***Final Accepted***: *02 June 2023*

DOI: https://doi.org/10.5281/zenodo.7996750

Table 3

F- Ratio of the Mean scores of teachers on welding craft operations

| Operation | Between groups sum of squares (SSB) | Within groups sum of squares (SSW) | Variance between groups (VB) | Variance within groups (Vw) | F-Ratio | Obtained probability | Decision |
|---|---|---|---|---|---|---|---|
| 1 | 337.0108 | 6631.2766 | 168.5054 | 13.0536 | 12.9087 | 0.000 | Significant |
| 2 | 12.3388 | 5658.4606 | 6.1694 | 11.5839 | 1.8087 | 0.0317 | Significant |
| 3 | 340.9192 | 5193.1929 | 1704596 | 10.2229 | 16.6744 | 0000 | Significant |
| 4 | 402.2527 | 3371.6745 | 201.1263 | 6.6373 | 30.3031 | 0.000 | Significant |
| 5 | 594.33 | 3347.6781 | 297.1650 | 6.5899 | 45.6939 | 0.000 | Significant |
| 6 | 73.270 | 3082.6156 | 36.6350 | 6.06814 | 6.0372 | 0.006 | Significant |
| 7 | 329.92 | 7458.2514 | 164.960 | 14.6816 | 11.2358 | 0.000 | Significant |
| 8 | 434.6743 | 8145.2569 | 217.3371 | 16.0339 | 13.5548 | 0.000 | Significant |
| 9 | 458.3212 | 6984.589 | 229.1606 | 13.7485 | 16.6679 | 0.000 | Significant |
| 10 | 329.220 | 9156.2589 | 164.610 | 18.0241 | 9.132757 | 0.0015 | Significant |
| 11 | 394.710 | 8011.4560 | 197.3550 | 15.7706 | 12.51412 | 0.000 | Significant |
| 12 | 61.8220 | 110118.1161 | 30.9110 | 19.9176 | 1.551947 | 0.03125 | Significant |
| 13 | 36.4983 | 5759.8216 | 18.2492 | 11.3776 | 1.6039 | 0.03045 | Significant |
| 14 | 73.6543 | 10271.7230 | 36.8272 | 20.2199 | 1.82133 | 0.03032 | Significant |
| 15 | 298.0863 | 6852.5410 | 139.0431 | 13.4892 | 10.3077 | 0.000 | Significant |
| 16 | 19.9231 | 8708. 1601 | 9.9616 | 17.1420 | 0.5811 | 0.0025 | significant |
| 17 | 47.5263 | 2019.1012 | 23.7632 | 3.9746 | 5.9788 | 0.0117 | Significant |
| 18 | 41.1036 | 9019.1012 | 20.5518 | 17.8958 | 1.1484 | 0.03754 | Significant |
| 19 | 402.2527 | 3371.6745 | 201.1263 | 6.6373 | 30.3031 | 0.000 | Significant |
| 20 | 329.92 | 7458.2514 | 164.960 | 14.6816 | 11.2358 | 0.000 | Significant |
| 21 | 61.8220 | 110118.1161 | 30.9110 | 19.9176 | 1.551947 | 0.03125 | Significant |
| 22 | 36.4983 | 5759.8216 | 18.2492 | 11.3776 | 1.6039 | 0.03045 | Significant |

Table 3 reveals the F-Ratio of the Mean scores of teachers on students' practical skill performance on technical college trades. The analysis indicated that there was significant difference on the Mean scores of the three groups of teachers at 0.05 level of significance on all the operations.

The result indicated that the null hypothesis of no significant difference was rejected .

## DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

***Received***: *02 May 2023*
***Revised***: *21 May 2023*
***Final Accepted***: *02 June 2023*

DOI: https://doi.org/10.5281/zenodo.7996750

The chapter deals with the discussion of the findings, the summary of the research procedure, conclusions and recommendations.

**Discussion**

The findings of this study have been arranged and discussed according to the research questions and hypotheses formulated. Regarding research question one, the 22 technical college trades operations showed Grand Means ranging from 3.51-3.86, portraying the 22 operations suitable for the instrument based on the criterion of 3.50 cut-off point. These findings agreed with the findings of Okeke (2016), Bent (2019), Amike (2018) who in their individual studies discovered that these operations are the major practical operations in technical college trade..

The findings that 22 items were found suitable for inclusion in the rating instrument were based on the conclusion of Borg and Gall (2019), Brown (2021, 2022) and Nworgu (2020). In their conclusion, they said that items that satisfied all psychometric properties are adequate for selection.

The findings also showed that the instrument possessed a high content and face validity. For face validity, four experts in technology education and three in measurement and evaluation reviewed the instrument. For content validity, the experts ensured that the instrument covered the practical skill areas of technical college trade in the NTC curriculum and the Harrow's (2022) model was used to prepare the table of specification. Validity is the most important of the technical standards in instrument development, since it tests the honesty of a test (Uzoagulu, 2018). Ikeji (2019) opined that content validity is established by demonstrating that the test items are a sample of the universe in which the test instructor is interested.

The findings also showed that the reliability of the 22 operations ranged from 0.62-0.90. The reliability for the whole instrument was 0.89. Uzoagulu (2018) opined that a high positive correlation coefficient shows that the test or the instrument is reliable.

For the guidelines and usage of the instrument, the researcher stipulated that the teachers should have practiced the trade operations several times in the workshop for the purpose of understanding the instrument, its administration, scoring and interpretation patterns. This recommendation was supported by the view of Ugochukwu (2021) who observed that instrument developed for assessing practical skills performance should be used in the actual work setting or a similar work environment.

The result of hypothesis one revealed that there was a significant difference in the mean scores of the teachers in the other 22 operations. This was an indication that discriminated in awarding scores to students in 22 operations. The reason for the disparity in scoring may be due to the fact that the different groups of raters must have received different practical and pedagogical exposures during their training in school.

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***Revised***: *21 May 2023*
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DOI: https://doi.org/10.5281/zenodo.7996750

The result of hypothesis two revealed that there was no significant difference in the mean scores of the teachers in all the 22 test items that could be included in the instrument Thus, in this work, the test items in the instrument were adequate for assessing students in technical college trades. This finding was supported by the conclusions of Nworgu (2020, 2022). He stated that items that satisfied all psychometric properties e.g. validity, reliability, usability aspects etc. are adequate for selection.

**Restatement of the problem**

A major responsibility of technical education programme is to train and impart practical skills in the production of skilled craftsmen who will be enterprising, self-reliant and intelligent to understand the increasing complexities of technology (FGN, 2004). During the teaching and learning processes, evaluation helps in making sound decisions, about student& progress in acquiring practical skills and knowledge. Katz and Snow (1980) stated that for competence to be adequately measured there must be clear delineation of behavioral expectations in respect of all possible psychomotor skills involved in the tasks as demanded by the job.

Practical work has been widely used in technical college workshops as a method of teaching technical subjects. When students are engaged in practical work to produce things either individually or in groups some measures of assessment must be carried out to measure the learning outcomes in their practical work. The teachers are therefore called upon to realize the need for coming up with ways and means through which valid marks could be awarded. The only option is to develop a valid and reliable instrument to assess students' practical skills, which they have acquired in the course of the learning.

Okeke (2016) observed that technical college teachers evaluate practical work by merely taking a cursory look at them and then assigning any grade they thought the student deserved. No serious effort appeared to have been made in evaluating the quality or characteristics of individuals' practical work by at least preparing a definite procedure of evaluation. With invalid and unreliable testing instruments wrong decisions regarding the students may occur which can adversely affect future learningAli (2020) stressed the need for teacher to develop standard instruments, which could be used to assess students in their various trade area like welding craft, aeromechanic, plumbing, carpentry and joinery, cabinet making, painting and decoration, electrical installation etc. welding craft trade as modules in the NBTE curriculum in Nigeria lack adequate evaluation instrument for assessing students' practical skill. This an identified problem to which this research addressed.

**Summary of the Study**

Practical work has been widely used in technical college workshops as a method of teaching technical subjects. Practical work makes learning easy, more comprehensive, and real, more

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involving and student driven. It is known that the purpose of practical work is to develop and test students' practical skills. More so, practical work improves students' skill, knowledge and attitude toward tools, materials, machinery and safe use of them (Okeke, 2016).

Technical college teachers need dependable and accurate assessment instrument to test students' competencies in make wise decisions regarding their students' practical skills. Literature of this study was reviewed in-line with stated objectives of the study, development and validation of an instrument for assessing students' practical skill performance in trades in technical colleges.. The study focused on operations and items to be selected into the instrument, validity, reliability of the instrument and guidelines for administration, scoring and interpretation.

The study answered five research questions and tested two hypotheses. Instrumentation research design was employed for the study. A well-constructed test items were developed and utilized. The population for the study comprises 276 teachers in technical colleges holding B.Sc., HND and FTC qualifications in Mechanical Technology. No sample was made for the study. A test -retest method of testing reliability, using Pearson product moment correlation was used to determine the reliability of the instrument. Experts in Technology education and measurement and evaluation validated the instrument.

The instrument had three sections. Section A was designated for academic qualification of teachers (AQT). Section B was on welding craft operations while Section C was on items to be selected for the instrument. Six hundred copies of the instrument were given to 276 welding craft trade teachers to administer on their students. Five hundred and eleven were duly completed and returned.

Data collected were analysed using Mean, Cronbach Alpha, F-ratio and Pearson Product Moment Correlation and Scheffe's multiple range tests.

**Major findings of the study**

The major findings of the study are as follows:

1. Twenty two trade operations were selected for the instrument.
2. Twenty two items of the developed instrument were considered appropriate for use in assessing students' practical skill performance in technical college trades.
3. The instrument was satisfactorily valid, as it possessed a high content and face validity.
4. The reliability of the whole instrument was 0.89 and that of the sub- scales ranged from 0.62- 0.90.
5. The instrument should be used to measure the degree of skill demonstrated by technical college final year students. Guidelines on the scoring of the instrument and interpretation of test data were also provided.

**Conclusions**

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The developed instrument has been found to satisfy all the psychometric properties required and to be satisfactorily valid and reliable for use in rating technical college students' practical skill performance in various trade.

**Implications of the Findings**

This study has implication for students, teachers, examining bodies and curriculum planners. Technical colleges will benefit from using the developed instrument. Conscientious practice of the skills in the developed instrument will enable the students acquire skills for gainful employment, reducing both unemployment and poverty. Students can also know when they have achieved a required level of mastery of the skills or have met industrial standard. This, therefore, can be a guide towards studying or practicing the operations.

The teachers in technical colleges will benefit from the developed instrument in the sense that, the evaluation of the practical will be based on the same standard.

The teachers will also use the developed instrument to diagnose areas of strength and weakness, which will foster re-instruction and re-appraisal for optimum students' performance. The teacher will also use the results of the assessment to modify his teaching methods so as to be more effective in the job. The curriculum planners would use the information in planning viable and quality welding craft Programme. They will also appreciate that the Programme should not only emphasize the cognitive aspect of welding craft but also merge skill and knowledge to such an extent that skill will be higher than knowledge so as to provide the students with entry level skills to occupations in welding.

**Recommendations**

On the basis of the findings and conclusions, the researcher recommends that:

1. Technical college teachers should use this instrument for assessing technical college students' practical skill performance.
2. To avoid future differential rating on students' practical skill performance by the rater, workshops and seminars are recommended for the teachers to enable them familiarize themselves with the techniques of using the instrument.

**Limitations of the Study**

In the course of carrying out this study the researcher experienced many limitations, namely:

1. Transportation to get to technical colleges in the Niger- Delta areas of Delta and Rivers states constituted serious problem. This affected the population of the study, as Copies of the questionnaire were not returned from the colleges.

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2. The population of teachers with HND plus PGDE was scanty, thus the return rate of the instrument was therefore low.

**Suggestions for further studies**

The following topics have been suggested for further investigation.

1. Similar study should be carried out to cover other NABTEB zones in Nigeria.
2. Development and validation of practical skill Rating Instrument for technical College students in other trades such as Auto-mechanics, Plumbing, Painting and Decoration e.t.c.

***Received***: *02 May 2023*
***Revised***: *21 May 2023*
***Final Accepted***: *02 June 2023*

DOI: https://doi.org/10.5281/zenodo.7996750

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***Final Accepted***: *02 June 2023*

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***Revised***: *21 May 2023*
***Final Accepted***: *02 June 2023*

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***Received**: 02 May 2023*
***Revised**: 21 May 2023*
***Final Accepted**: 02 June 2023*

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***Received***: *02 May 2023*
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