
**PSYCHO-PRODUCTIVE SKILLS MULTIPLE CHOICE TESTS ITEMS
FOR ASSESSING STUDENTS IN TECHNICAL COLLEGES - A
REVIEW**

DANJUMA A. OMBUGUS, Ph.D
*Department of Technical Education,
College of Education, Akwanga,
Nasarawa State.*

And

REBECCA I. UMARU, Ph.D
*Department of Art and Social Science Education,
Faculty of Education,
Nasarawa State University, Keffi,
Nasarawa State.*

Abstract

Psycho-productive Skills Multiple Choice Test (PSMCT) is a device of determining the extent students can demonstrate observable skills taught and to perform them under conditions similar to working conditions of the trade. It is systematic procedures to ascertain the level to which students have achieved the set of capabilities specified in a curriculum. The psycho productive skills multiple choice test is an alternative to rating scale used for assessing psychomotor domain learning objectives. The skills multiple choice test is capable of overcoming the limitations associated with rating scale such as time consuming and measuring product at the expense of process skills for manipulative skill development in students. The test gives room to judging the production process of students and can be used through the internet. For sustainable employment, graduates of technical and vocational education have to be effectively assessed using psycho-productive skills multiple choice tests. In the growing digitalization of evaluation techniques, psycho productive skills multiple choice tests gives the view of cost reduction, less labor and time saving. This paper therefore summarizes chronologically the various studies carried out on assessing trades learning objectives using the skills multiple choice test in Mechanical Engineering Craft, Agriculture, Block and Concrete making, Electrical Installation, Clothing and Tailoring works among others. The paper also describes the state of the art of utilizing psycho-productive skills multiple choice tests.

Keywords: Skills multiple choice items; Test; Assessment; Student; Technical College

The objectives of Technical College Programs in National Board for Technical Education (NBTE, 2003) among others are to: provide the technical knowledge and vocational skills necessary for Agricultural, Commercial and Economic Development; give training and impart the necessary skills to individual who shall be self-reliant economically. The Board emphasized that the program when successfully completed can be used for employment purposes. In technical colleges, assessment of students learning in relation to the achievement of the above objectives is carried out after classroom instructions by the teachers and National Business and Technical Examination Board (NABTEB) at the final examination. However, the researcher observed that the assessment instrument used by the teachers and NABTEB only help to determine students' achievement in the cognitive and affective domain objectives. There are negligible observable results in the achievement of objectives in the area of psychomotor domain. Ombugus (2015) observed that the National Technical Certificate (NTC) practical examination conducted by teachers and NABTEB are mere rating of finished products and not skills development. Earlier, Okeme (2013) considered rating scale as subjective and prone to abuse by the raters. To achieve observable skill acquisition by students of NTC level at graduation, there is need to assess students' performance through well developed and validated psycho-productive skills multiple choice test items.

The technical college graduates in the study area lack a range of skills and in-depth competence for securing and sustaining employment to make a living from the program. The present assessment practice seems invalid and unreliable to provide solution to the observed skills assessment problem. In the absence of reliable instruments for assessing manipulative skills, the obvious consequence is that evaluators may make decisions on National Technical Certificate based on data obtained from inappropriate assessment instruments. An attempt has been made in this paper to review the state of art on the use of psych-productive skills multiple choice test items to complement the present achievement tests use by teachers and NABTEB to enable students to demonstrate the acquisition of production skills at the NTC level and probably practice them at graduation.

Objective

The main objective of this review paper is to provide information on the utilization of psycho-productive skills multiple choice tests to bridge the measurement gap caused by the limitations of the favored rating scale method for NTC practical which measures only cognitive ability rather than psych-productive skills in production and also to supplement the rating scale which is good in measuring only product rather

than process (step-by-step) skill development of students in production areas of psychomotor objectives. The paper is based on the comprehensive review of available related literature on psychomotor domain taxonomy towards the achievement of the comprehensive objectives of the National Technical Certificate program. The review is arranged chronologically from the recent studies (2016) to (1993).

Literature on Psycho-productive Skills Multiple Choice Tests

Ombugus and Umaru (2016) carried out a study on psycho productive skills multiple choice test items for assessing students in mechanical engineering craft in technical colleges. The study adopted the instrumentation research design and it was carried out in Nasarawa State, Nigeria. The population of the study was 248 National Technical Certificate (NTC) III students comprising of three ability groups (42 high, 140 average and 66 low abilities). A 305 item draft copy of psycho productive skills multiple choice test items was developed, validated and utilized as the instrument for the study. The test was used to assess students in the four Government Technical Colleges in Assakio, Mada Station, Agwada, and Doma in the study area. The data collected were analyzed using split-half technique and Kuder-Richardson (K-R20). The reliability of the test was 0.84. It was found out that there were significant differences in the mean scores of the three groups (high, average and low). It was recommended among others, that examination bodies (NABTEB), WAEC and NECO should integrate the psycho productive skill multiple choice test in their examination process for certification of NTC students.

Ombugus and Ogbuanya (2015) conducted a study on the development and validation of Workshop-Based Process Skills Test (WBPST) in Metal Grinding for assessing students in Technical College for work. The study adopted the instrumentation design and was carried out in Nasarawa state, Nigeria. The population for the study was 25 NTC III students comprising of three ability groups (8 high, 12 average and 5 low abilities). A 74 draft copy of workshop based process skills items were generated, validated and utilized to develop WBPST. The developed test was used in assessing the students in Government Technical College, Assakio. The data collected were analyzed using Cronbach Alpha, Kendall Coefficient concordance and Scheffe test. The reliability of the WBPST revealed coefficient of 0.76. It was found out that there were differences in the mean scores of three ability groups (high, average and low). The inter rater reliability coefficient of the WBPST was 0.57. It was therefore recommended that the National Business and Technical Examination Board and West Africa Examination Council should integrate the workshop based process skills test in their examination process for certification of National Technical Certificate students.

Mustapha (2015) developed and validated a computer based psychomotor skills test (CBPST) for assessment of Technical College Students' achievement in Metal Fitting. The study adopted the instrumentation design and was carried out in Yobe state. The population for the study was 148 National Technical Certificate (NTC) III

students comprising of three ability groups (36 high, 70 average and 42 low abilities). Sixty-three computer based psychomotor skills items were developed, validated and utilized by the study. The test was used in assessing students in four technical colleges in the study area. The data collected were analyzed using split- half technique, Kuder-Richardson (K-R20) and analysis of variance (ANOVA) to test the null hypotheses at 0.05 level of significant. The results of the data analyzed relating to reliability revealed coefficient of 0.82. It was found out that there were significant difference in the mean scores of the 3 ability groups (high, average and low) of the students. Tukey Kramer test for multiple comparison revealed that there were significant difference in the mean scores of the high and low abilities, but no significant difference in high and average abilities. It was therefore recommended that National Business and Technical Examination Board (NABTEB) and West Africa Examination Council (WAEC) should integrate the test items in their examination process for certification of NTC students.

In the area of metal work technology, Ombugus (2015) developed and validated a Computer-Based Psychomotor Skills Test (CBPST) for assessment of Technical College Students in Metal Grinding. The study adopted instrumentation design and was carried out in Nasarawa State. The population for the study was 148 National Technical Certificate (NTC) III comprising of three ability groups (36 high, 70 average and 42 low abilities). Sixty three computer-based psychomotor skills items were developed, validated and utilized by the study. The test was used in assessing students in four technical colleges in the study area. The data collected were analyzed using split-half technique, Kuder-Richardson (K-R20) and analysis of variance (ANOVA) to test the null hypotheses at 0.05 level of significant. The results of the data analyzed relating to reliability revealed coefficient of 0.82. It was found out that there were significant differences in the mean scores of the 3 ability groups (high, average and low) of the students. Tukey Kramer Test for multiple comparison revealed that there were significant difference in the mean scores of the high and low abilities, but no significant difference in the mean scores of the high and average abilities. It was therefore recommended that National Business and Technical Examination Board (NABTEB) and West Africa Examination Council (WAEC) should integrate the test items in their examination process for certification of NTC students.

Adio (2014) carried out a study on development and validation of Workshop Based Process Skills Tests (WBPST) for students in metal grinding trade in technical colleges. It adopted instrumentation design and was done in Kaduna state. The population for the study was 25 National Technical Certificate (NTC) III students. Eight-nine workshop-based process skills items were generated, validated and utilized to develop workshop-based process skill test. The test was used in assessing students in Government Technical College Malali. The data collected were analyzed using Cronbach alpha, Kendall coefficient of concordance and Scheffe Test. The reliability of the workshop based process skill test revealed coefficient of 0.76. It was found out that there were significant differences in the mean scores of three ability groups (high,

average and low) of the students at 0.05 level of significant. The inter rater reliability coefficient of the workshop based process skills test was 0.57. It was recommended that Examination bodies (National Business and Technical Examination Board and West Africa Examination Council) should integrate the workshop-based process skill test items in their examination for certification of NTC students.

Ombugus and Ogbuanya (2014) conducted a study to validate psycho-productive skills multiple choice test in metal drilling for technical colleges. The study adopted the instrumentation research design and was carried out in Nasarawa state. The population for the study was 148 National Technical Certificate (NTC) III students comprising three ability groups (36 high, 70 average and 42 low abilities). A 94 item draft copy of psycho-productive skills multiple choice test items were validated and utilized to develop the instrument. The instrument was used in assessing students in the four technical colleges in the study area. The data generated were analyzed using split-half technique and Kuder Richardson (K-R21). The reliability coefficient of the test was 0.82. It was found out that there were significant differences in the mean scores of the high and low ability groups, and no significant difference in the mean scores of high and average ability groups. It was therefore recommended that examination bodies (NABTEB, WAEC and NECO) should integrate psycho-productive skills multiple choice test in their examination process for certification of NTC students.

Okeme (2011) conducted a study on development and validation of psycho-productive skills multiple choice Test items for students in Agricultural Science in Secondary Schools in Kogi State. The study focused on the development and validation of psycho-productive skills multiple choice test items for students in agricultural science in secondary schools. The study adopted the instrumentation design and was carried out in Kogi State. The population for the study was 13,925 senior secondary three students in 239 public schools. The sample for the study was 675 students comprising three ability groups (201 high, 314 average and 160 low abilities). Multistage sampling technique was adapted. Purposive sample was used to select 15 schools with a population of 2,793. Systematic sampling was used to select 675 SS 3 students from the students' population of the 15 schools. A 148 psycho-productive skills test items was developed and utilized by the study. The instrument was subjected to face, content and criterion referenced validation. Face validation was carried out by five experts in the Faculty of Education, University of Nigeria Nsukka. The content validation was carried out using a test blueprint validated by nine subject matter experts in the area of animal production, crop production and agricultural technology. The psychometric properties of the items were first determined by administering the instrument to a pilot sample of 40 students drawn outside the sample. The criterion-referenced validation was also carried out by utilizing the scores of the pilot sample with the use of cut score. The reliability of the items was determined by using split-half technique and Kuder-Richardson K-R 20. This yielded co-efficiency of 0.87 for animal production, 0.86 for crop production and

0.88 for agricultural technology with overall coefficient of 0.87. Percentages, formulae of difficulty index, discrimination index, detractor index and K-R20 were utilized to answer the research questions. The analysis of variance (ANOVA) was utilized to test the null hypothesis at 0.05 level of significant. It was found out that the items had CVR of between 0.333 and 1.000, difficulty indices of between 0.30 and 0.70, discrimination of not less than 0.20, positive (+) distraction and criterion-referenced validity of 50% and above. It was also found that there were significant differences in the mean scores of the three ability groups (high ability, average ability and low ability). Scheffe test for multiple comparison revealed that there were significant difference in the mean scores of the high and low abilities but no significant difference in the mean scores of the high and average abilities. It was therefore recommended that external examination bodies (WAEC and NECO) should adopt the psycho-productive skills multiple choice test items in their examination for certification of the students. It was also recommended that teachers should be encouraged by government to make use of psycho-productive skills multiple choice test items during teaching and assessing productive learning aspect of agricultural science in students.

Zhang and Lam (2008) carried out a study on Development and Validation of Racquet ball skills Test for Adult Beginners in Cleveland USA. The purpose of their study was to produce an instrument for measuring the performance of adults in racquetball skills. The study used instrumentation design. The sample for the study was 131 adults comprising of 82 male and 44 female college students. They were provided 90 minutes sessions of practice and preparation one week before the testing. Eight skills were developed and validated using a subjective 5 point rating scale. A single round-robin tournament was conducted simultaneously for male and female participants. They were evaluated in their overall skill level by a trained evaluator. Auto-correlation of the data revealed that all the test items had validity and coefficients equal to or greater than 0.5 except for two items-service placement to the left and to the right and were dropped from further analysis.

The finding of the study from regression analysis revealed that the remaining six skills test items were predictive of two criterion variables with the multiple correlation equal to 0.67 and 0.68 for males and 0.61 and 0.75 for females. The researcher recommended that testing over minimum of two days would be the best protocol for most racquetball skills.

Azizi-Ur-Rehman (2007) conducted a study on the development and validation of objective test items in physics for class nine in Rawalpindi city, Pakistan. The main objective of the study was to provide an instrument for measuring the skills achievement of students in physics in class nine in Rawalpindi City. The researcher used the instrumentation design to carry out the study. Six boy's schools were selected out of the 29 in Rawalpindi city. The instructional objectives were designed and a table of specifications was used to construct the items.

The instrument was validated content wise by six experts in physics with the use of table of specifications after which the instrument was administered to the students. After administration, the scripts were scored objectively and interpreted by finding the difficulty index and discrimination index of each item by applying the formulae. The findings of the study were as follows;

1. Most of the items had difficulty indices of between-1.0 and 2.0 (good standard).
2. Only few of the items were too easy or too difficulty with discrimination indices of between 1.0 and 2.0.
3. One fourth of the items had difficulty indices of 1.5 and above (ideally good range).
4. The mean, median, and mode values for the HA group fall close to one another. The researcher therefore recommended that:
 - Too easy and too difficult items make a test invalid and unreliable and should be avoided.
 - Catchy or dodgy items were always deceptive and promote guessing or cheating so should not be included in the options.
 - The instructional objectives, table of specifications, construction of test items, scoring and interpretation of data should be in this order and a complete harmony among them.
 - A valid test should contain items which are very difficult, difficult, normal or easy in good proportion. The researcher suggested that 20% of the item should be very difficult or difficult, 70% should be normal and the remaining 10% should be easy.

Bukar (2006) conducted a study on Development and Validation of Laboratory-Based tests for assessing practical skills of higher National Diploma Students in Electronic Maintenance and Repairs. The research was designed to develop and validate laboratory-based tests in Electronic Maintenance and repairs that will improve the method of teaching and assessing students in the course. Three research questions and one hypothesis were formulated to guide the study. Twenty work station-based tasks and 462 practical skills were generated through a process of performance assessment through review of the literature. A table of specification was constructed based on the Padelford (1984) model of psychomotor domain to ensure balance in assessment of the six levels of the psychomotor domain. Three experts helped in content validation of the tasks and practical skills and there after 24 lecturers and technologists from 24 polytechnics offering Electronic Maintenance and Repairs were used for item-by-item content validation. Based on the results of the item-by-item content validation, laboratory based tests of 20 works station-based tasks and 462 practical skills were constructed.

The constructed laboratory tests were used in assessing 48 HND students in the department of Electrical Engineering, Kaduna Polytechnic during 2002/2003 academic session. The data generated were analyzed using Cronbach alpha, product moment

correlation, centroid method of factor analysis, Kendall coefficient of concordance and F-Ratio Test. The result of the data analysis relating to factorial validity of the laboratory based tests revealed that 77.01%, 65.5% and 83.79% of the variance of the three sub-tests respectively were due to general factor.

The internal consistency of the tests on measuring instrument and Testing, Fault finding and repairs and alignment were 0.71, 0.55 and 0.47 respectively. The inter-rater reliability coefficient of the laboratory based tests is 0.41 and there was significant relation between five rater's ratings of the practical skills of some HND students in the tests. Based on these results, it was recommended to National Board for Technical Education (NBTE) that the laboratory tests be adopted in all the polytechnics running Higher National Diploma (HND) in Electronic Communication Technology). The instrument was constructed for teaching and assessing performance of students, in electronic maintenance and repairs skills.

Effiong (2006) carried out a study on development and validation of alternative to practical test for measuring skills in electronic devices and circuits in technical colleges. The purpose of the study was to develop and validate alternative to practical tests to measure skills possessed by students in electronics, devices and circuits –a component of R/TV Electronics trade. The study has five specific purposes, five research questions and three null hypotheses. Instrumentation research design was employed. The study was carried out in Akwa Ibom State of Nigeria. The population for the study comprised of 93 final year R/TV electronic students in four technical colleges in the state. The whole population was used. A table of specifications was prepared and two tests comprising 100 multiple choice items (Test A) and 30 short answer items (Test B) were developed. Dave's model of psychomotor objectives was used. Content and face validation of the tests was done by 11 experts. Pilot testing employing test re-test method was carried out on 52 final year R/TV students in Cross River State Technical Colleges. Weak and poor items were either improved or replaced after validation and reliability testing. Thereafter, the tests developed were administered concurrently with a practical test set by NABTEB at NTC examination level. Data collected through field testing were analyzed using K-R 20 formula, item analysis, Pearson Product Moment Correlation Technique and T-test at 0.05 level of significant. Items with poor psychomotor properties were dropped. Findings were that 87 multiple choice items and 30 short answer items were valid, reliable and suitable for inclusion in the final version of the tests developed, the tests developed and the practical test set by NABTEB had high correlation coefficients ranging from 0.88 to 0.91, and the three null hypotheses showed that there was no significant difference in students' performances in the developed tests and the practical test. Recommendations were made based on the findings and suggestions for further studies were stated.

Amaka (2002) carried out a study on development and validation of an instrument for assessing the Affective Work Competencies of Industrial Technical

Education Students. The purpose of the study was to develop an instrument for assessing the affective work competencies of industrial technical education students. For this purpose, five research questions and one hypothesis were formulated to guide study. The final year industrial technical education students whose population size was 78 and were in the federal colleges of education (Technical) located at Asaba, Omoku and Umunze in the South-South and South-East geo-political zones of the Federal Republic of Nigeria were used for the study. The study was instrumentation study. One hundred and twenty test items initially generated were submitted to 10 experts in industrial technical education for face validation. The result of the exercise showed that 83 test items survived the exercise and 37 test items were regarded to be defective and unacceptable for the purpose. Consequently the 83 test items were subjected to Q-sort Allocation Technique by five validates selected by balloting from the 10 experts for further improvement on the validity of the instrument. In all 68 test items that survived the exercise became the 68 items of the Affective Work Competencies Instrument for Industrial Technical Education Students (AWCIITES). The instrument was trial tested using 18 final year industrial technical education students of F.C.E (T) Asaba. The data generated were analyzed; the internal consistency reliability coefficient of the AWCIITES was 0.840 and the internal consistencies reliability coefficient of the clusters ranged from 0.244 to 0.830. They were computed using Cronbach Alph formula. The inter-correlations among the clusters and the instrument were determined using Pearson-Product Moment Correlation Machine Formula. Data were analyzed using percentages, mean statistics and one way analysis of variance (ANOVA). The hypothesis was tested at 0.05 level of significant. The findings revealed that:

- (1) The 68 test item of the AWCIITES that resulted from the face validation and Q-Sort Allocation Technique was suitable for the purpose of the study.
- (2) The reliability coefficient of the instrument was fairly high (0.540).
- (3) The internal consistencies of reliability coefficient of the 15 clusters of the instrument ranged from 0.244 to 0.830. The cluster that had the least coefficient reliability was “careful” cluster and “friendly/pleasant” cluster with the highest coefficient reliability.
- (4) The inter-correlations among the 15 clusters of the AWCIITES were both negative and positive in magnitude and directions and low (-0.5358) to high (0.6966). The correlation between the 15 clusters and the entire test (AWCIITES) ranged from low (-0.1808) to high (0.7084).
- (5) The student of federal college of education (Technical) Umunze recorded the highest mean scores in most of the 15 clusters of the instrument than FCE (Technical) Omoku and FCE (Technical), Asaba respectively.
- (6) There were no significance differences in the mean scores of the students in the three institutions in 12 out of 15 clusters of the instrument.

(7) However, there were significant differences in the mean scores of the entire students in the three of the 15 clusters of the instruments. It was concluded that the AWCITES have been developed and validated with focus on work competencies of NCE industrial students.

Odu (2001) conducted a research on development and validation of an instrument for assessing students' psycho-performance in block-laying and concreting. The study was conducted, with the major purpose of developing and validating an instrument for assessing students' psycho-performance in block-laying and concreting in technical colleges. The researcher determined the validity and reliability of the instrument and established its usability. Five research questions were considered and two null hypotheses tested. The instrumentation design was used for the study. Eighteen block-laying and concreting operations from the National Technical Certificate (NTC) curriculum which were amenable to a table of specifications were selected for which 133 test items were generated. A total of 153 block laying and concreting teachers, consisting the population were used to rate 580 block laying and concreting students on the entire test items. Appropriate statistical tools such as mean, grand mean, Person product moment correlation coefficient, Cronbach alpha, F-ratio, and Scheffe multiple range test were used for analyses of data. It was found that

(1) 114 items out of 133 items developed were considered suitable for use in the instrument.

(2) The instrument had sufficient content and face validity and the reliability coefficients of items related to various operations ranged from 0.60 to 0.91 for the whole instrument.

(3) The one-way analysis of variance used to test hypothesis 1 revealed that there was no significant difference in the mean scores of the teachers on the students psycho-performance on cavity wall construction, while there was significant difference in the mean scores of the teachers on the students psycho-performance on the other 17 block laying and concreting operations. Hypothesis 2 revealed that there was no significant difference in the mean scores of the teachers on students' psycho-performance in all the test items at 0.05 level of significant.

The major findings of the study were as follows:

(1) The sixteen block laying and concreting operation were selected by the teachers for the instrument.

(2) One Hundred and fourteen test items out of the 133 items were selected for the instrument.

(3) The instrument possessed a high content and face validity.

(4) The reliability of the whole instrument was 0.86 and that of the sub-scales ranged from 0.60-0.91. The instrument had a high reliability.

(5) The researcher's guidelines on the use of the instrument was that it should be use to measure the degree of block laying and concreting competencies demonstrated

by technical college final year students. Guidelines on the scoring of the instrument and interpretation of test data were also provided.

On the basis of the findings, the researcher recommended that:

- (1) Block laying and concreting teachers should use this instrument for assessing students psycho-performance in block laying and concreting operations.
- (2) To avoid future differential rating on student psycho-performance by the raters, workshops and seminars were recommended for the teachers to enable them familiarize themselves with the techniques of using the instrument through the training patterns given to the experimental group (three group of teacher who rated student psycho-performance on block laying and concreting operations).

Yalams (2001) conducted a research on the development and validation of metal work process evaluation scheme. The purpose of the study was to develop and validate a scheme, which could be used by metal work lecturers at the Nigerian certificate of Education (NCE) level for evaluating students skills during practical metal work instructions. Specifically, the study addressed five research questions which boarded on identifying the major fitting and machine operations often carried out by NCE metal work students, the basic skills and competencies which lecturers often value and assess in their students during practical metal work instructions, an appropriate rating scale, the validity and reliability of the developed scheme. Through review of the National Commission for Colleges of Education (NCCE) curriculum for metalwork, a task specification table was developed. Based on this table, 18 major task clusters were identified and further expanded into 164 sub-tasks, which termed the number of items of the scheme.

Furthermore, 13 assessable competencies and a 4-point descriptive rating scale with various response categories were developed and cooperated into the scheme. Draft copy of the scheme was face validated by a total of 210 metalwork lecturers drawn from the 41 NCE (Technical) awarding institutions all over the country. The scheme was tried out on 40 NCE final year metal work students randomly sampled from 5 of the 41 different institutions. In each of the institutions used for the try out, four metal work lecturers were used as a 4-man panel of assessors for observing and assessing the students as they carry out specific given tasks within the scheme during the try-out. The reliability of the scheme was established after analyzing data obtained from the try-out. In analyzing the data, each of the four assessors' ratings for each of the items were paired into six set and correlated. The Pearson Product Moment Correlation formula was used through Mini-Tab computer software for the analysis. Results of the analysis revealed that all the 164 items of the scheme were highly reliable for inclusion in the final copy of the scheme.

Furthermore, reliability of the various items of the scheme as well as that of the entire scheme as a whole was obtained using the Kendall co-efficient of concordance tau. The obtained tau (w) for the various clusters ranged between 0.31 and 0.97, whereas that of the entire scheme was found to be 0.97. The implication of this

outcome is that, the developed MPES was found to be valid, reliable and practically useful for evaluating student's skills practical mental work. It is recommended that, the NCCE, other controlling and examining bodies such as the NUC, NBTE, NABTEB, NECO should adopt the developed Metal work Process Evaluation Scheme (MPES) as a standard instrument for evaluating students in practical metal work in their various institutions and/or establishments (where applicable).

A study was carried out by Igbo (1997) on Development and validation of a psycho-productive skill test for assessing senior secondary school students in clothing and textile. This study was designed to develop, validate and try out on instrument for assessing student's psycho-productive skills in the area of clothing and textile at the SSS level. Six research questions and null hypotheses guided the study. In order to develop the instrument, performance objectives were isolated from the senior secondary school (SSS) clothing and textile curriculum. The performance objectives were utilized to develop a detailed table of specification based on the seven levels of psych-motor domain. The table of specification was utilized to develop 170 test items. The items were validated and 164 items were found adequate and then pilot tested. Item analysis was carried out and 160 items were finally selected. The selected items were field tested on 204 SSS III students of clothing and textiles students from Lagos and Akwa Ibom States who registered for clothing and textiles at the Senior Secondary Certificate Examination (SSCE) for 1995/96 session.

Reliability of the instrument was established using Kuder-Richardson formular (K-R21). Data collected from the field were analyzed using mean, point biserial correlation coefficient, item analyses techniques and t-test at 0.05 level of significant.

The findings of the study were:

- 152 item psycho-productive skill test (PST)
- PST point-biserial coefficient range of 0.05 to 0.86,
- PST reliability coefficient of 0.80
- PST difficulty index range of 0.20 to 0.79
- PST discrimination index range of 0.40 to 0.78
- The t-test revealed similar difficulty and discrimination levels for students of both states. The major implication of the findings of the study is that the PST is valid and reliable and can be used to assess SS students in clothing and textiles. It is therefore recommended that PST should be adopted either in part or whole or modified for the assessment of SSS clothing and textiles students.

Fatunsin(1996) carried out a study on Development and Standardization of Performance-Based Test for assessing students in Agriculture in secondary schools in Ondo state. This study developed and standardized a performance-based test instrument (PBST) for assessing students in agriculture in secondary schools. The study determined the validity and reliability of the test and established other psychometric properties. Five research questions were answered and two hypotheses tested. The study used both instrumentation and developmental research designs. The study

isolated two performance objectives from the curriculum, developed psycho-productive activities in the seven areas of the secondary school agricultural science curriculum that lent themselves to table of specifications from where 150 performance-based test items were generated. A total number of 600 students participated in responding to the test developed. The psychometric properties of the test were determined using reliability, validity estimates and item analysis (difficulty, discrimination and detractor indices). Appropriate statistical tools such as point-biserial correlation, Cronbach alpha, t-test were involved to enhance analysis of data. It was found out that:

- (1) The instrument had high point-biserial correlation of .71 and reliability coefficient of .94, making the test valid and reliable;
- (2) There were 134 out of 150 items that satisfied all the psychometric properties;
- (3) The t-test analysis revealed that the male and female student maintained similar difficulty and discrimination levels on the test items. If the result of this study is implemented, it will be of great benefit to the students, to improvement in agriculture and also help to boost agricultural productivity in the nation. Therefore, the researcher recommended the test to schools and examining bodies for adoption.

Garba (1993) conducted a study on the development and validation of instrument for evaluation of practical skills in woodwork projects in Technical Colleges. The study focused on the evaluation of practical skills in woodwork projects. Instrumentation survey designs were adopted for the study. The actual instruments were generated through task analysis and based on process and product of carrying out projects in wood work. Woodwork teachers totaling seventy-one were used in validating the instrument. The internal consistency of the instrument was determined by conducting a pilot test and using Cronbach alpha to analyze the data generated. The data for inter rater reliability was analyzed using Kendall coefficient. This instrument was developed based on the project method of assessing practical skills and not the procedural steps of carrying out the project.

Conclusion

From the aforementioned review done on studies related to psycho-productive skills multiple choice tests for assessing psychomotor domain objectives, the achievement of the objectives of technical and vocational education programs at the NTC level cannot be realized if all the domains (cognitive, psychomotor and affective) are not fully assessed by examination bodies. The present mode of assessment of knowledge and cognitive ability achievement of students in technical college made the realization of skill development in students of technical colleges unachievable. Hence, students graduated from schools with very little occupational entry based skills for work. This situation called for the review of psycho-productive skills multiple choice test items to fill the gap created by the teaching and learning of technical and vocational trade subjects towards achieving their objectives. With the introduction of Computer Based Test (CBT) by Joint Admission and Matriculation Board (JAMB) in Nigeria, the renewed research interest in psycho-productive skills multiple choice test items has

become imperative. This review therefore provided information on the utilization of psycho-productive skills multiple choice tests for measuring productive skill learning in technical and vocational trade subjects towards the achievement of the comprehensive objectives of the subjects in technical colleges. This information could be utilized by teachers to adopt psycho-productive skills multiple choice tests in measuring skill learning of students in production areas of NTC curriculum.

References

- Adio, E.C. (2014). Workshop Based Process Skills Test in Metal Grinding for Students in Technical Colleges. *Journal of Home Economics Research* 21, 92-104. Available on-line at www.heran.org
- Amaka, L.O.C. (2002). Development and Validation of an Instrument for assessing the effective work Competencies of Industrial Technical Education Students. (*Unpublished Ph.D Thesis*). University of Nigerian, Nsukka.
- Aziz-Ur-Rehman (2007). Development and Validations of Objective test Items in Psychics for (Class six) in Rawalpindi city. Pakistan Research Repository.
- Bukar, B. (2006). Development and Validation of Laboratory-Based test for assessing practical skills of Higher National Diploma Students in Electronic Maintenance and Repairs. (*Unpublished Ph.D Thesis*) Department of Vocational Teacher Education, University of Nigeria, Nsukka.
- Effiong, E.J. (2006). Development and Validation of Alternative to Practical Tests for Measuring Skills in Electronic Devices and Circuits in Technical College. (*Unpublished Ph.D Thesis*). University of Nigeria, Nsukka.
- Fatunsin, F. (1996). Development and Standardization of Performance-based tests in Agricultural Science in Ondo State. (*Ph.D Thesis*) Department of Vocational Teacher Education, University of Nigeria, Nsukka.
- Garba, N.L. (1993). Development of an Instrument for evaluating practical projects in woodworking. *Unpublished Ph.d Thesis*, University of Nigeria Nsukka.
- Igbo,C. A. (1997). Development and Validation of Psycho-productive Skills Test for assessing senior secondary school students in senior secondary schools in clothing and textiles. *Ph.D Thesis*, University Nigeria, Nsukka.

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- Mustapha, U. N. (2015). Psycho-productive skills test items in metal fitting for students in technical colleges in Nasarawa State. *Computer Education Research Journal (CERJ)* 2(1), 112-119.
- National Board for Technical Education (NBTE, 2003). National Technical Certificate and Advance National Technical Certificate Programs Curriculum and Module Specifications.
- Ombugus, D.A. & Ogbuanya, T.C. (2014). Development and Validation of Psycho-productive Skills Multiple Choice Test Items in metal drilling for assessing students in technical colleges. *Nigeria Vocational Association Journal (NVAJ)* 19(2), 117-127.
- Ombugus, D.A. & Ogbuanya, T.C. (2014). Development and Validation of workshop-based process skill test in metal fitting for improving students' skills in technical colleges for work. *Journal of Education and practice* 5(23), 1-10. Available on-line at www.iiste.org
- Ombugus, D.A. & Umaru, R.I. (2016). Psycho Productive Skills Multiple Choice Test Items for Assessing Students in Mechanical Engineering Craft in Technical Colleges. *European Journal of Education Studies* Vol. 2/issued 2/2016 available on-line at www.oapub.org/edu
- Ombugus, D.A. (2015). Psycho-Productive Skills Multiple Choice Test Items in Metal Grinding for assessing students in Technical Colleges. *Asian Journal of Education and Training* Vol.x,No.x, xx-xx, 2015. Available on-line at <http://www.asuabibkubehiyrbaks.cin/index.php/EDU>
- 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 Nigeria, Nsukka.
- Ogbu, E.J. (2009). Development and Factorial Validation of Basic Electricity Interest Inventory. *Nigerian Vocational Journal* , 14(1) 1-12.
- Okeme, I. (2011). Development and Validation of Psycho Productives Skills Multiple Choice Items for students in agricultural Science in Secondary Schools. (Unpublished Ph.D Thesis) submitted to the Department of Vocational Teacher Education, University of Nigeria, Nsukka.

Yalams, S.I. (2001). Development and Validation of Metalwork Process evaluation Scheme. (Unpublished Ph.D Thesis). Department of Vocational Teacher Education, University of Nigeira, Nsukka.

Zhang, J.J. & Lam, E.T.C. (2008). *The Development and validations of a Racquetball Skills Test Battery for Young Adult Beginners*. USA: Lawrence Erlbaum Associates Inc.