DEVELOPMENT OF COMPUTER-BASED INSTRUMENT FOR ASSESSING STUDENTS` PRACTICAL PROJECT IN ELECTRONICS WORKS TRADE AT TECHNICAL COLLEGE LEVEL IN GOMBE STATE, NIGERIA

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Abstract

The study developed a Computer-based instrument for assessing students` practical project in Electronics works trade at Technical Colleges in Gombe state, Nigeria. Instrumentation research design was used for the study. Four research questions were raised to guide the study. Eigh Electronics works Teacher and 25 NTC III students were randomly sampled for the study. Two instruments were used for data collection, a structured questionnaire titled Task and skill Appropriate for Electronics works Questionnaire (TASAFEWQ) and Computer-Based Practical Project Assessment instrument (C-PRAPAI), the validity of the instrument was determined by two experts from Federal College of Education (T) Gombe. The instrument C-PRAPAI was further trial tested in three technical colleges in Adamawa state, where 25 NTC III students participated in the exercise. Mean was used to answer research question one and two while data obtained from the trial test were used to determine the internal consistency of the instrument using Cronbach Alpha. Results indicated that, the overall reliability of the instrument was 0.78. The results of the study showed that, 32 practical tasks and 15 performance objectives were found appropriate for inclusion in C-PRAPAI and the results from trial test showed that, the instrument C-PRAPAI have a reliability coefficient of 0.78. Visual basic studio 2015 with Visual basic language and SQL (MS Access) were used to incorporate the instrument into computer-based instrument. Therefore, C-PRAPAI was valid and reliable and can be used for assessment purposes. Based on the findings it was recommended among others that, examination bodies like WAEC, NABTEB and NECO should adopt the use of C-PRAPAI in assessing students` practical project at technical college level. It was also recommended that teachers that teaches electronics works trade in technical colleges should adopt the use of the instrument (C-PRAPAI) when assessing students` practical Project at Technical college level.

Keywords: Development, Computer Based, Instruments and Practical Project, Electronics works

Introduction

Increased attention on the use of computer-based software in the classroom in recent years and the present skills demand for life-long learning and self-reliance in workplaces form the basis for redirecting the instructional delivery in Technical colleges to Computer-based (Aleburu, 2008). This is because today's society is becoming more and more dependent on digitalized devices and as such become inevitable for students who will live and work in the digital world.

Nigerian educators as part of global education communities have equally joined this technological train by using Computer-Based Instruction in a numbers of educational

programmes across variety of fields and disciplines, these approaches have been proved to be effective (Bashir, 2015).

Computer-based software has been introduced in teaching and learning process for long (Bashir, 2015). The use of computer-based software for teaching and learning according to Bashir has made the processes to be more effectives, since there is success in using software in teaching and learning, using computer-based assessment instrument can also improve the assessment processes (Abd-el-Aziz, 2013).

The increased attention on using computer software as indicated above have however prompted a parallel upsurge in the design and development of several software package suites for use in the classroom for both teaching and assessment processes (Hassan, 2019). Meanwhile, the design and development of educational software packages, especially in the area of Electronics Works Trade at Technical college levels were reported to have been carried out for teaching and learning in Nigeria (Bashir, 2015). But based on available literatures to the researchers known has been developed for assessment purpose in Electronics works trade.

Electronics works trade is one of engineering trades in the National Business and Technical Examination Board (NABTEB) syllabuses, offered in technical colleges. The electronics works syllabus is designed to provide training for individuals interested in electronics works and competence in repairing electronics appliances, installing and performing routine and preventive maintenance on electronics appliances, consequently, providing employment opportunities for earning a living (NABTEB, 2015). Some of practical project obtainable at Technical colleges based on NABTEB (2015) are: Construction of simple circuits such as Multi vibratos, Astable vibrator, Mono stable vibrator and Oscillation circuits. These practical projects help the students to develop knowledge, attitude and skills for interpreting a circuit diagram and to become an expert in building a given circuit.

The main trust at the technical college level of education involves practical training using newer methodologies of applied science, materials, tools, devices, equipment, machineries, and other resources to enable competent workers solve practical problems (Okoro, 2002). The practical training may involve manipulation of materials or objects in form of process of carrying out particular task, as simple as construction of simple circuit of practical project and also using some testing equipment for faults diagnoses of electronics appliances as applicable in electronics works trade as stated in NBTE curriculum. Therefore, to determine the extent at which a practical skills is acquired, particularly, in practical project, there is need for assessment using a valid and reliable instrument.

Assessment is an important aspect of any skills acquisition training, either formal or informal. It helps the assessor to determine whether changes have occurred and to what extent. Assessment is therefore, the bedrock on which trainings are usually based. Assessment can also be used to award grades to student after a practical project is given to them. Creswell (2012) view assessment as integral part of teaching and learning process. It is used to measure behaviour of students while the students get to know whether they have learnt what is expected of them or not. Learning objectives are meaningless, except the objectives are clearly stated in behavioral form, and tested during and after completion of training (Hassan, 2015).

The practical project assessments conducted by teachers are mere product rating and not process rating (Olaitan, 2014). This approach of assessment according to Oguntayo and Idris (2014) has limitation, due to its inability to assess the process of carrying out the practical project. According to Okoro, (2002) the best method of practical project assessment is combination of both process and product method of assessment, as both will cover all the procedures involve in performing the project and also take care of the finished product. The major properties of good assessment instrument according to Uzoagulu (2011) are validity and reliability.

Validity of an instrument describes the extent to which the conclusions or interpretations derived from the results of any assessment are well grounded or justifiable, that is relevant and meaningful (Cook & Beckman, 2006). Justifying the need for validating an assessment instrument, Okoro (2002) state that, valid instrument requires uniformity in testing and scoring procedures, this can only be obtainable when an assessment instrument passes validity and reliability tests.

Reliability is one of the most desirable technical merits in any educational evaluation process. Reliability is an indication of the consistency between two measures of the same instrument (Alias, 2005). Alias further stated that an instrument may be highly reliable but may not be necessarily valid, but a highly valid instrument is usually reliable.

From the aforementioned facts, it is clear that, for Technical Colleges to meet its objectives of production of skilled craftsmen and increase access of graduates of technical colleges to work opportunities in Nigeria, a valid assessment instrument that will combine both the product and process method of assessment is required, for quality assurance on the skilled acquired. On this note the study developed a Computer-Based instrument for assessing students' practical Project at Technical College level in Gombe State.

Statement of the Problem

The product rating assessment method used by Electronics works teachers at Technical colleges according to Oguntayo and Idris (2014) has limitation, due to its inability to assess the complete process of carrying out the practical project. The implication of this assessment method is that the scores and grades assigned to students in practical project work by the teachers may not be true representative of their performances. Although students will be awarded with certificates at the end of their programme, they do so without adequate practical skills that will enable them create or secure sustainable jobs (Hassan, 2015).

Based on the available literature to the researchers, many instrument have been developed for assessing students` practical skill, but none of such instrument developed for assessing student practical project in Electronics works at Technical colleges in Gombe state. In addition, there is no such instrument developed, validated and incorporated into computer-based application software for use in assessing students` practical project at technical college level in Gombe state, Nigeria.

Research Questions

The following research questions were raised to guide the study:

i. What are the practical task items considered appropriate for inclusion in an instrument for assessing students` practical project in Electronics works trade at technical college level in Gombe state?
ii. What are the performance objectives considered appropriate for inclusion in an instrument for for assessing students` practical project in Electronics works trade at technical college level in Gombe state?
iii. What is the reliability of the developed instrument for for assessing students` practical project in Electronics works trade at technical college level in Gombe state?
iv. What computer Programming Languages will be used to incorporate the developed instrument for assessing students` practical project in Electronics works trade at technical college level in Gombe State into a computer software?

Methodology

The study was conducted in Gombe State Technical Colleges. The study employed Instrumentation research design. Eight Electronics work Teacher and 25 NTC III students were used as sample for the study, random sampling by balloting method was used. Two instruments were used for data collection, a structured questionnaire titled Task and skill Appropriate for Electronics works Questionnaire (TASAFEWQ) and the Computer-Based Practical Project Assessment Instrument (C-PRAPAI). The instrument was validated by two experts from Federal college of Education (Technical) Gombe, their comments and suggestions were considered. The reliability of the instrument was determined by pilot testing the instrument on fifteen respondents whom were randomly selected from a Technical College in Adamawa state.

Data were collected by administering the questionnaire to the respondents (Electronics Works Teachers) by the researcher with the help of two trained research assistants. The researcher administered the questionnaire to the respondents in Government Science Technical College (GSTC) Gombe while the trained research assistants administered the questionnaire to respondents in GSTC Kumo and GSTC Tula respectively. The period for administration and retrieval of the questionnaires was two weeks. Similarly, a request letter for Trial test of the developed instrument (C-PRAPAI) was sent to the principal of each technical college in Gombe state. The technical colleges were provided with Soft copies of the instrument and the guidelines on how to administer the test. The assessors were required to observe and rate each student while performing a given task from the beginning to its completion.

The data collected for research question one and two were analyzed using Mean scores of the respondents, with the aid of the Statistical Package for Social Science (SPSS). Each item was scored based on five-point rating scale of Highly Appropriate (5), Appropriate (4) Moderately Appropriate (3), Inappropriate (2) and Highly Inappropriate (1).The cutoff point was 3.00, that is, 5+4+3+2+1/5= 3.00. Any item with mean score of 3.00 and above was considered appropriate to be included in the final copy of the instrument. On the other hand, any item with a mean rating below 3.00 was considered inappropriate for inclusion in the instrument. While the data collected from research question three were used to determine reliability using Cronbach Alpha formula of establishing reliability coefficient. Reliability of the instrument (C-PRAPAI) was 0.78.

Procedure for Development of the Assessment Instrument

The following steps were followed to develop the Computer-Based Practical Project Assessment Instrument (C-PRAPAI):

i. Identification of task and operations in electronics works trade using NABTEB syllabus (2015)
ii. Identification of performance objectives (observable psychomotor skills)
iii. Developing table of specifications/test blue print
iv. Writing out items for the task operations
v. Try-test of the final instrument
vi. Final selection of the items
vii. Development of strategies of using the instrument
viii. Creating and run test the software using Visual Basic studio 2015
ix. Incorporate the instrument in to computer based application software using the developed strategies as a guide in collaboration with computer programmer.

Results

Research Question one: What are the practical task items considered appropriate for inclusion in an instrument for assessing students` practical project in Electronics works trade at Technical college level in Gombe state?

Table 1: Teachers Mean Responses on Practical Tasks Items in Faults Diagnoses and Repairs of Electronics Appliances Appropriate for Inclusion in an Assessment Instrument

S/N	Practical Tasks Items	Mean ($\bar{X}$)	Remark
1	Scraping the surface to be soldered	3.83	Appropriate
2	Scraping the pins of the components/wires	4.20	Appropriate
3	Preparing joints for soldering	3.87	Appropriate
4	Raising the temperature of the joint to be soldered to required level	3.68	Appropriate
5	Applying sufficient lead paste	3.42	Appropriate
6	Apply sufficient soldering flux	2.85	Not Appropriate
7	Deflluxing of soldering bit	4.01	Appropriate
8	Applying correct soldering tools	2.50	Not Appropriate
9	Laying components on the vero board	3.76	Appropriate
10	Preparing joints for Desoldering	3.77	Appropriate
11	Using brush brush for desoldring	3.83	Appropriate
12	Using sucker pump for Desoldering	4.33	Appropriate
13	Inserting components in to PCB without damage	4.03	Appropriate
14	Removing component from PCB without damage	3.68	Appropriate
15	Soldering on double track PCB	4.00	Appropriate
16	Desoldering on double track PCB	3.68	Appropriate
17	Demonstrating the use of Pliers for cutting/twisting wires	3.77	Appropriate
18	Demonstrating the use of Meter for continuity test	3.83	Appropriate
19	Demonstrating the use of Meter to test Active components (Transistior, Triac, Mosfet)	4.33	Appropriate
20	Demonstrating the use of Meter to Test Passive components (Resistor, Capacitor Diode)	4.03	Appropriate
21	Demonstrating the use of meter to test AC Voltage/Current	3.68	Appropriate
22	Demonstrating the use of meter to test DC voltage/current	4.00	Appropriate

23	Demonstrating the use of oscilloscope to test rectifier circuit	4.70	Appropriate
24	Testing circuit on Bread Board	4.50	Appropriate
25	Constructing half wave rectifier	4.34	Appropriate
26	Constructing full wave rectifier	3.76	Appropriate
27	Constructing power supply with transformer	3.77	Appropriate
28	Constructing power supply without transformer	3.83	Appropriate
29	Constructing an oscillator circuit	4.33	Appropriate
30	Constructing multivibrator	4.03	Appropriate
31	Constructing astable vibrator	3.68	Appropriate
32	Constructing simple logic circuit	4.00	Appropriate
33	Constructing a simple power amplifier	3.68	Appropriate
34	Constructing simple voltage amplifier	4.70	Appropriate

Results from the Table 1 revealed that, out of 34 practical project items drafted to be included in the assessment instrument only 32 practical project tasks items have mean rating of 3.00 and above, and were therefore considered appropriate for inclusion in the assessment instrument. Two practical project tasks items fell below 3.00 and were considered inappropriate for inclusion in the assessment instrument.

Research question two

What are the performance objectives considered appropriate for inclusion in an instrument for for assessing students` practical project in Electronics works trade at Technical college level in Gombe state?

Table 2: Teachers Mean Responses on Perfomance Objectives in Faults Diagnoses and Repairs of Electronics Appliances Appropriate for Inclusion in an Assessment Instrument

SN	Performance Objectives	Mean ($\bar{X}$)	Remark
1	Promptness in starting a given task	4.76	Appropriate
2	Ability to select correct type of lead paste	4.56	Appropriate
3	Appropriate selection of tools /equipment	4.45	Appropriate
4	Right connection/settings of component to be soldered c dessoldered	3.77	Appropriate
5	Timeliness in completing a given task	3.90	Appropriate
6	Care of tools and equipment during and after work	4.90	Appropriate
7	Observed safety rules related to given task	4.03	Appropriate
8	Quality and neatness of the job.	4.57	Appropriate
9	Kinaesthetic posture on the job	3.78	Appropriate
10	Handling tool/equipment skilfully	4.70	Appropriate
11	Proper workshop uniform	2.88	Not Appropriate
12	Ability to set the range selector of Meter to the desired point (AC DC, DIODE)	3.65	Appropriate
13	Identification of correct components to be used	3.45	Appropriate
14	Ability to understand the circuit diagram	4.06	Appropriate
15	Ability to select component of correct specification	3.67	Appropriate
16	Correct usage of Oscilloscope	4.30	Appropriate

Results from the Table 2 revealed that, out of 16 performance objectives drafted as performance objectives to be included in the assessment instrument only 15 performance objectives have mean rating of 3.00 and above, and were considered appropriate for inclusion in the assessment instrument. One performance objective fell below 3.00 and was considered inappropriate for inclusion in the assessment instrument. See Appendix one and two for how the final instrument look like.

Research Question Three
What is the reliability of the developed instrument for assessing students` practical project in Electronics works trade at Technical college level in Gombe state?

Table 3: Reliability Coefficients of the Instrument for Assessing Students` Practical Projects in Electronics works Trade at Technical College Level in Gombe state

S/N	Task	Number of Items	Reliability Coefficient
1	Constructing Circuits	15	0.78
	Overall Reliabilit Coefficient		**0.78**

Table 3 above revealed that, the results obtained for reliability coefficient of the instrument is 0.78. Which means the instrument is reliable and be used for the purpose it was meant for.

Research question Four
What computer software will be used to incorporate the developed instrument for assessing students` practical project in Electronics works trade at Technical college level in Gombe State into a computer software?

In order to answer research question 4, a guideline for rating and interpreting the scores of the C-PRAPAI was developed. The details of the guideline was used as a guide in collaboration with a computer programmer to incorporate the instrument into a computer software, which was named (C-PRAPAI), using the following computer programming languages: Visual Basic and Sql (Ms Access) as the Database. The screenshot of the software shows some features of the C-PRAPAI as presented in Figure 1. The software (C-PRAPAI) was designed with different menu, such as: Tasks, performance objectives, rating options, Reset option and Print option. The total score would automatically generated based on the user guide. The screen shoot of the software and the guideline for using the instrument are presented below:

Guidelines for the Rating and Interpreting of Score of the Instrument
Users should be objective when assessing students` practical skills, teachers should not for any reason over score or underscore any students.

How to use the instrument:
In the process of carrying out a task, the user should score the students using the rating scale based on how well the students performed; it should be done by simply writing out the score on the following rating scale: Highly Acquired (5), Acquired (4), Moderately acquired (3),Not Acquired (2), Highly Not Acquired (1).

(i) Total score for each item should be entered in the 'Total' column of the instrument.

(ii) The scores should be analyzed to get overall grade for a student for any task performed. For Example: if a student is to be assessed based on practical task on performing Soldering of component on PCB board from task cluster 1, and the student scored the following based on the observed skills as show in Table A

S/N	Performance Objectives	Ratings			
1	Promptness in starting a given task	5			
2	Ability to select the correct lead paste		4		
3	Appropriate selection of tools/equipment		4		
4	Right connection/settings of components to be soldered			3	
5	Timeliness in completing a given task		4		
6	Care of tool and equipment during and after work			3	
7	Observed safety rules related to a given task			3	
8	Quality and neatness of the job				2
9	Kinesthetic pasture on the job				2
10	Handling tools/equipment skillfully	5			

Based on the scores presented in Table A.
Total mark is:

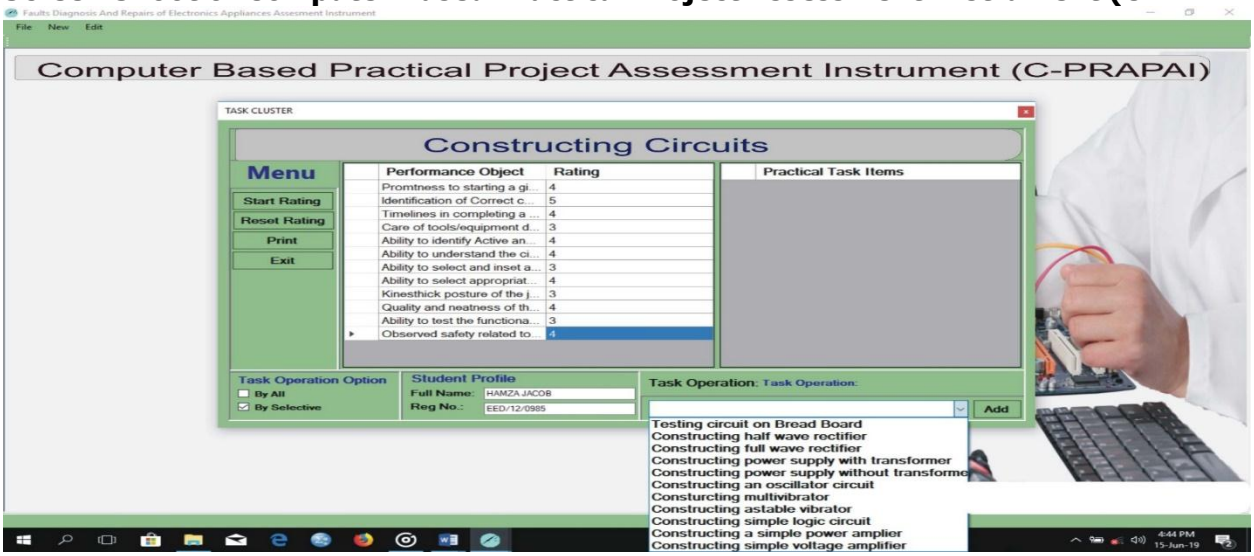
Highly Acquired (HA)	5x2=10
Acquired	4X3=12
Moderately Acquired	3X3=9
Slightly Acquired	2X2=4
Not Acquired	1X0=0

Total Score obtained is 36
Maximum mark that can be scored for this task is 50 (i.e. 5X10)

ercentage scored by student is: 35/50 x 100/1= 70%

NB: each operation in the instrument can be assessed independent of the others.

Screen Shoot of Computer Based Practical Project Assessment Instrument (C-PRAPAI)



Summary of Findings

The summary of findings of the study are as follows:

i. Thirty two out of thirty four practical tasks items were considered appropriate for inclusion in the final copy of the instrument.
ii. Fifteen out of sixteen performance objectives were identified and are considered appropriate for inclusion in the final copy of the instrument.
iii. The reliability coefficient of the instrument was 0.78 and is therefore reliable for educational purpose.
iv. Visual Basic Studio 2015 with Visual basic language and SQL (MS Access) were used to incorporate the developed instrument into computer based assessment software called Computer based project assessment instrument (C-PRAPAI). The operation and usage of the C-PRAPAI was found to be effective and efficient after subjecting it to trial test.

Discussion

Findings of the study were discussed in order that the research questions were arranged. Findings on research question one revealed that out of 34 task items generated for the study as practical tasks items required by teachers in assessing students` practical project, only 32 task operations were rated high, and considered appropriate for inclusion in the C-PRAPAI .The findings is in agreement with Adamu (2016) and Yalams (2001) who opined that determining of major task should start by reviewing literature in the occupational area and should start from the lowest level to the most complex stage.

Findings on research question two revealed that 15 performance objectives, which correspond to the practical task items were considered appropriate for inclusion. This include ability to select appropriate tool/equipment, promptness in starting a given task, etc. These were in accordance with Aminu (2015) who opined that in performing any practical operation, skills processes should be considered, observed and assessed, this will give assessor a passive judgment on students ability in conducting any operation than only passing judgment based on finished product. This also agrees with Adamu (2015) who viewed process assessment as the observation of performance and passing judgment. It is also in agreement with Okoro (2006) who stated that the best way to go about process assessment is through observation and rating skills. Therefore, in

order to observe and score students in process assessment, certain skills has to be considered, for instance, selection and manipulation of tools, care and handling of tools (Bukar, 2006). Similarly, UNESCO (2002) pointed out that in stating performance objectives of students, the nature of work to be performed and what skills is to be assessed should be considered more especially the cognitive, psychomotor and effective domains of the students while at work. These suggestions agreed with Okoro (2006), Okwelle and Okeke (2012) and Adamu (2016) who stated that the process should be multi-stage and educational objectives should be classified according to the cognitive, effective, and psychomotor domains. Students should be able to cooperate with others, identify tools and material used in a particular operation and should be able to adjust the machine accessories (set-up) correctly, avoid run down, composure at work, timely completion of the operation, quality of finished product and ability to observe safety at all stages of the operation.

The findings on research question three revealed that the reliability coefficient of the instrument (C-PRAPAI) was 0.78. According to Okoro (2006), any reliability coefficient of instrument up to 0.50 is considered appropriate. This shows that, the developed instrument is capable of yielding an acceptable result when assessing students` practical project to identify students` strength and weakness. Okwelle and Okoye (2012) view reliability of an assessment instrument as the extent to which it measures learning consistently. Similarly, Hassan (2019) opined that the reliability of an assessment instrument is the extent to which the instrument consistently and accurately measures learning objectives. When the results of an assessment instrument are reliable, it implies that repeated or equivalent assessment will provide consistent results.

The finding on research question four indicated that, the instrument was incorporated in to Computer based instrument. Using Basic Visual studio 2015 with Visual basic Language and SQL (MS Access) and named Computer based practical project assessment instrument (C-PRAPAI).
After Pilot testing the instrument have high reliability, this agrees with the work of Hassan, (2019) whose developed instrument was incorporated into computer based instrument with high reliability and his developed instrument was called Faults Diagnoses and Repairs Assessment Instrument.

Conclusion

There is no doubt on the rapid technology advancement recently witnessed in field of Technical and vocational education. Therefore, for technical teachers to remain relevance and take the advantages of the development in ICT, a serious restructuring is required, this may involve introducing or adapting innovations through designing more teaching and assessment instrument to improve teaching and learning. The findings of the study showed that, the functionality of the instrument is friendly and the results provided by the instrument was accurate. Finally, the instrument was reliable and can be used for assessment purposes.

Recommendations

The following recommendations are made:

i. The usage of computer-based assessment instrument (C-PRAPAI) is recommended for use at all technical colleges, therefore, electronics works teachers are encouraged to use it for teaching the practical course.
ii. Workshop or seminar should be organized through Ministry of Education for Technical college teachers on how to use the instrument (C-PRAPAI)
iii. Examination bodies (NABTEB, NECO and WAEC) should be encouraged to adopt the instrument and use for practical examination.

References

Adamu, G. G. (2015). Development and validation of an assessment instrument for assessing practical skills in Mechanical Engineering craft practice in Technical Colleges in Yobe State. *Unpublished M.Tech Thesis*, Modibbo Adama University of Technology, Yola.

Abd-El-Aziz, A. A. (2013) Development and validation of auto-mechanics intelligent tutor for teaching auto-mechanics concepts in Technical Colleges *Unpublished Doctoral Dissertation*. Department of Teacher Education University of Nigeria Nsukka.

Alias, M. (2005). Assessment of learning outcomes: Validity and reliability of classroom test. *World Transaction on Engineering and Technology Education* 4 (2) 178-184 Retrievedfromhttp://www.wiete.com.au/journals/WTE&TE/pages/vol.4, %20No.2%20(2005)/16-Alias32.pdf, on May 15, 2014.

Aleburu, J. O. (2008). Design and utilization of ICT based Instructional delivery System and students' learning outcomes in computer appreciation course in colleges of education in Lagos state. *Unpublished Doctoral Dissertation.* Department of Teacher Education. University of Ibadan. Ibadan.

Aminu, T. U. (2015). Development and validation of an assessment instrument for assessing performance of students on welding and fabrication trade at technical college level. *Unpublished Ph.D. Thesis*, Moddibo Adama University of Technology, Yola.

Bashir, M. (2015). Availability and utilization of information and communication technology facilities for teaching of basic electricity in Adamawa State Technical Colleges. U*npublished M.Tech Thesis*, Modibbo Adama University of Technology, Yola.

Bukar, B. (2006). Development and validation of laboratory-based test for assessing practical skills of higher national diploma student in Electronics Maintenance and Repairs. *Unpublished Ph.D Thesis,* University of Nigeria, Nsukka.

Cook, D. A., & Beckman, T. J. (2006). Current concepts in validity and reliability for psychometric instruments: theory and application. *The American Journal of Medicine,*119 (2) 78-83. Retrieved on 21 May 2014 from http://www.cursuri.sas.unibuc.ro/.../uploads/.../cook2006 on May 20, 2014.

Creswell, J. W. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative Research*. Boston: Edward brothers Inc, 34-150.

Hassan, A. A. (2015). Assessment of training facilities and job prospects of graduate of National Directorate of Employment skills acquisition centres in Adamawa state. *Unpublished M. Tech Thesis.* Modibbo Adama University of Technology, Yola.

Hassan, A. A. (2019). Development and validation of an instrument for assessing students` practical skills in faults diagnoses and repairs in electronics works trade in technical colleges in Northeast Nigeria. *Unpublished Ph.d Thesis*, Moddibo Adama University of Technology, Yola.

National Business and Technical Examination Board (2015) National Business and Technical Examination Board. Syllabuses for engineering trade examination based on NBTE Modular Curriculum (Revised Edition) Benin: Government press.

Oguntayo, T. C., & Idris, A. M. (2014). Development and validation of automobile battery and charging system maintenance training manual for technical colleges students. *International Journal of Science and Engineering Research.* 5 (12) 491-505.

Okoro, O. M. (2002). *Measurement and evaluation in education*. Obosi: Pacific Publisher Ltd, Pp. 43-48.

Okoro, O. M. (2006). *Principle and methods in vocational and technical education*Nsukka: University Trust Publishers.

Okwelle, P. C., & Okoye, K. R. E. (2012). Development and validation of instrument for assessing practical skills in building electronics systems in Nigerian Technical Colleges: *Journal of Emerging Trends in Engineering and Applied Sciences,* 3 (3) 156-164. Retrieved May 26, 2016 from http://www.jeteas.scholarlinkresearch.org.

Olaitan, O. O. (2014). Development and validation of tests for Assessing student`s skills in Motor Vehicle Mechanic Work for Technical Colleges. *Unpublished Doctoral Thesis.* Department of Vocational Teacher Education. University of University of Nigeria Nsukka.

United Nations Educational, Scientific and Cultural Organization (2002).*Evaluation and Assessment*. Unpublished Manuscript. UNESCO/Nigeria Project of Revitalization of Vocational and Technical Education in Nigeria. Kaduna: UNESCO.

Uzoagulu, A. E. (2011). *Practical guide to writing research projects in tertiary institution* (New Edition) Enugu: John Jacobs Classic Publishers Pp. 32-121.

Yalams, S. M. (2001). Development and validation of Metalwork process evaluation scheme: *unpublished Ph.D thesis,* University of Nigeria, Nsukka.

	Rating Scale: Highly Acquired (HA) 5 Acquired (A) 4 Moderately Acquired (MA) 3 Not Acquired (NA) 2 Highly Not Acquired (HNA) 1 **Construction of practical project**	**Performance Objectives (Observable Psychomotor Skills)**	Promptness to starting a given task	Ability to select correct type of lead	Appropriate selection of tools /equipment	Right connection of component to be soldered	Timelines in completing a given task	Care of tools and equipment during and after work	Observed safety rules related to a	Quality and neatness of the job	Kineasthetic posture on the job.	Handling tool/equipment skillfully.	Ability to set the range of meter to the desired point.	Identification of correct component	Ability to understand the circuit	Ability to select component of correct	Correct usage of Oscilloscope	**TOTAL**
	Practical task Items	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1	Scraping the surface to be soldered	-																
2	Scraping the pins of the components/wire	-																
3	Preparing Joints for soldering	-																
4	Raising the temperature of the joint to be soldered	-																
5	Applying sufficient lead paste	-																
6	Defiluxing of soldering bit	-																
7	Laying component of the vero board	-																
8	Preparing joint for desoldering	-																
9	Using brush for desoldering	-																
10	Using sucker pump for desoldering	-																
11	Inserting components into PCB without damage	-																
12	Removing component from PCB without damage	-																
13	Soldering on double track PCB	-																

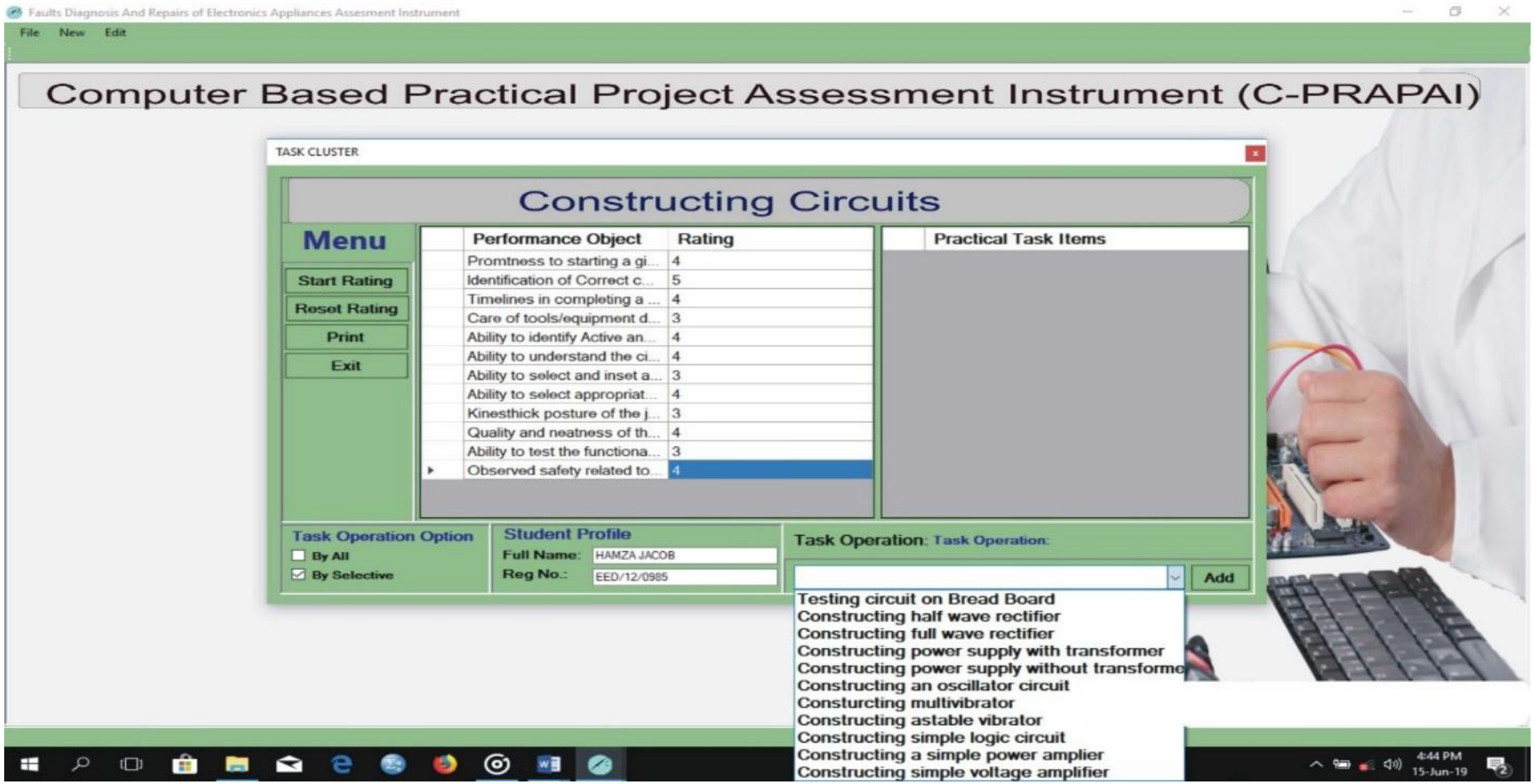
14	Deslodering on double track PCB	-																
15	Demonstration the use of pliers for cutting wires	-																
16	Demonstrating the use of meter for continuity test	-																
17	Demonstrating the use of meter to test active components	-																
18	Demonstrating the use of meter to test passive component.	-																
19	Demonstrate the use of meter to test AC Volt/Cur	-																
20	Demonstrate the use of meter to test DC Volt/Cur	-																
21	Demonstrating the use of oscilloscope to test cct.	-																
22	Testing circuit on Bread Board	-																
23	Construct half wave rectifier	-																
24	Construct full wave rectifier	-																
25	Construct power supply with transformer	-																
26	Construct power supply without transformer	-																
27	Construct an oscillator circuit	-																
28	Construct multivibrator	-																
29	Construct astable vibrator	-																
30	Construct simple logic circuit	-																

31	Construct a simple power amplifier	-																
32	Construct simple voltage amplifier	-																

Appendices

1. **FINAL COPY OF THE INSTRUMENT (HARD COPY)**

2. **COMPUTER-BASED PRACTICAL PROJECT ASSESSMENT INSTRUMENT (C-PRAPAI) (SOFT COPY) SCREEN SHOOT**


Faults Diagnosis And Repairs of Electronics Appliances Assesment Instrument
File New Edit
Computer Based Practical Project Assessment Instrument (C-PRAPAI)
TASK CLUSTER
Constructing Circuits
Menu
Start Rating
Reset Rating
Print
Exit
Performance Object
Rating
Promtness to starting a gi... 4
Identification of Correct c... 5
Timelines in completing a ... 4
Care of tools/equipment d... 3
Ability to identify Active an... 4
Ability to understand the ci... 4
Ability to select and inset a... 3
Ability to select appropriat... 4
Kinesthick posture of the j... 3
Quality and neatness of th... 4
Ability to test the functiona... 3
Observed safety related to... 4
Practical Task Items
Task Operation Option
By All
By Selective
Student Profile
Full Name: HAMZA JACOB
Reg No.: EED/12/0985
Task Operation: Task Operation:
Add
Testing circuit on Bread Board
Constructing half wave rectifier
Constructing full wave rectifier
Constructing power supply with transformer
Constructing power supply without transforme
Constructing an oscillator circuit
Consturcting multivibrator
Constructing astable vibrator
Constructing simple logic circuit
Constructing a simple power amplier
Constructing simple voltage amplifier
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15-Jun-19