COST BENEFITS ANALYSIS OF PSYCHO-PRODUCTIVE MULTIPLE CHOICE AND RATING SCALE INSTRUMENTS IN MEASURING STUDENTS' PERFORMANCE IN SOIL CURRICULUM IN NIGERIAN UNIVERSITIES.

[1]IFEANYIEZE, F. O &[2] EGBO, B.

[1&2]Department of Agricultural Education University of Nigeria Nsukka, Enugu state
florence.ifeanyieze@unn.edu.ng

Abstract
Soil contents of agricultural education curriculum seems difficult to students' grasping and retrieval due to assessment instruments used by examiners. Teachers and examination bodies make use of essay and alternative to practical to assess performance. These types of instruments assess students cognitively while psychomotor is neglected. These students graduate with little or no practical ability as needed in the world of work. Teachers are interested in finding alternative instruments that could measure performance at low cost so that their graduates could perform in the world of work, hence the need for this study to determine the cost and benefits in assessing students with rating scale (RS) and psycho-productive-multiple-choice test (PT) as alternative instrument. The correlation study was carried in South East Nigeria. The population for the study was 122 made up of 42 Lecturers and 81 students all from Federal Universities with Agricultural Education programme in South East Nigeria. There was no sampling as the entire population participated in the study. Four sets of instrument were used for data collection. The items were validated by three experts while the reliability and stability of RS and PT were determined using Cronbach alpha and Kuder Richardson (K-R_{20}) which yielded coefficients of 0.86 and 0.84 respectively. Data was collected by the researchers and eight assistants. *The study revealed that RS had higher benefit but costs more while the PT costs less but had lower benefit. It was recommended that psycho-productive multiple choice test should be adopted in assessing students if the teacher is interested in practice and when less cost is under consideration but rating scale should be used when cost is not considered due to higher benefits bearing in mind other limitation of RS.*

Keywords: Rating-scale; Assessment; Multiple-choice-test; Cost; Soil

Introduction

Agricultural Education is one of the programmes in Nigerian universities. The programme has many courses including irrigation technology, fish and fish pond management education, farm mechanics in addition to soil and its water conservation education. This study is focused on the soil contents of agricultural education curriculum. The curriculum contents on soil concentrates on meaning and importance of soil, fertility status, properties, physic-chemical properties, conservation practices among others. Soil is the upper most part of the earth crust where plants naturally grow and human and animal activities take place. Soil is a mixture of minerals and decaying organic matter gathered gradually over the years on the surface of the earth and supplies mechanical support/sustenance to plants (Dilip, 2012). Soil refers to unconsolidated thin layer of the earth's surface with organic materials that serve as home and natural medium for plant and animal growth (Asogwa, 2014 & United States Department of Agriculture, (USDA, 2014)). Soil, therefore, means a mixture of minerals, decaying organic matter with countless organisms on the surface of the earth capable of supporting plant and animal life.

In supporting plant and animal lives, soil plays crucial roles serving as a medium for plant's growth holding them firmly, habitat for living organisms and as engineering medium among others (Ifeanyieze, 2012). Soil determines the nature of vegetation present and indirectly the number and types of animals that the vegetation can support in a place (Brady and Weil 2010). The quality of soil in a given place and the maintenance practises determine the nature of plants, ecosystem and the capacity of the environment to perform as expected. The soil also determines the amount and availability of water (soil moisture) and nutrients stored for plant use (Philip, John, Maria and Rosario, 2012). The quantity and nature of plants and animals that are supported by a particular soil depends on the status of its fertility which must be conserved and sustained for high production, food security and sustenance of life. Due to the importance of soil and need to maintain its fertility status for sustenance of life, it is integrated into the agricultural education curriculum with the aim of equipping students with knowledge and skills in maintaining soil fertility. Lecturers teach the soil content areas of the curriculum and determine the extent to which students grasp what they are taught through assessment

Assessment is an activity designed to collect data about the knowledge, skills and attitudes of a learner or group of learners for human resource development (Kellegham & Grenary 2001). Assessment focuses on (a) learners' performance, (b) use of percentage scores and grades and (c) use of records as source of information for evaluation (Kellegham & Grenary 2001). After teaching practical activities like conservation practices, soil testing and analysis among others, many teachers assess students' performance using rating scale.

Rating scale is an instrument used for assessing performance, personality traits, feelings, attitudes and preferences (Ali, 2006). Rating scale though used by teachers cannot be utilized to rate skills within a short period of about two hours which is an ideal time for assessment in practical activities. Probably this limitation induced

most teachers and external examination bodies to resort to the use of alternative to practical, objective or essay tests for certification. Students who were assessed cognitively on graduation find it very difficult to engage in meaningful practical work while those that go into teaching, find it very difficult to teach the soil contents of agricultural science curriculum in schools (Ifeanyieze, 2012). They, therefore, join those other unemployed youth rooming the street in order to make quick money (Oladeinde 2019). To worsen the matter, the period of compulsory National Youth Service Corps remains the scariest moment for many soil science graduates but the fear for some has disappeared since they joined apprenticeship in catering and baking (Oladeinde 2019). United Nation and Food and Agricultural Organization reports indicated that Sub-saharan Africa is a region with highest prevalence of under nourishment in the world thus, Nigeria has not been able to meet up with the national protein requirement due to low productive capacity of the soil coupled with high rate of unemployment in the country (Layide & Olayemi 2015). The main cause of graduate unemployment and criminal act as indicated by Elom (2016) was due to assessment methods adopted by teachers and examination bodies. Vocational subjects like agriculture focus on practicable skills and require suitable assessment tool for measuring students' learning outcome. This has been an issue in most vocational centers/school and examination bodies. It was observed by Elom (2016 that West African Examination Council (WAEC) and National Examination Council (NECO) in Nigeria assess students through alternative to practical which was more reorganized by stakeholders for certification rather than performance assessment that examine students on the level of skills acquired. To help students pass external examination organised by WAEC and NECO, teachers also routed to cognitive assessment of learners leading to beautiful certificate but with no skill. Therefore there was a need to find an alternative mode of assessing students in soil content area of agricultural education in order to help them acquire the necessary skills required for testing and maintaining fertility status for enhanced production, hence the need for psycho-productive multiple choice test

Psycho-productive-multiple-choice test (PT) is a performance objective assessment instrument designed to ascertain acquisition of skills in an occupation (Olaitan & Ali, 1997). PT is an assessment instrument used to determine the extent to which students acquire skills in carrying out stepwise activities in producing a given output. The psycho-productive multiple choice test items used in this study was constructed based on Simpsons taxonomy of educational objectives which has seven levels - perception, set, guided response, mechanism, complex overt response and origination; each level assesses gradual acquisition of process skills in an occupation (Okeme, 2011). The use of PT was based on its success when it was utilized by Simpson (1972) to measure skills in Home economics and it was also utilized by Warmbrod (1974) in assessing students of agriculture in specialized vocational areas in Ohio State University USA. Therefore, assessment of students was carried out using rating scale and psycho-productive multiple choice test items with their respective ingredients (inputs) to determine the performance scores of students. The

performance scores of the students were called benefits in this study while the inputs were called ingredients. The benefit (performance score) was analysed in relation with the cost of the ingredients in monetary terms utilized in using each of the two assessment instruments. Therefore, the researchers utilized RS and PT instruments in order to ascertain its suitability in relation to cost of ingredients in assessing students' performance in soil contents of agricultural education curriculum. Specifically, the study determined the

1. difference between cost of inputs of rating scale and psycho-productive multiple choice test in assessing students' performance in soil contents of agricultural education curriculum
2. difference between the benefit (percentage scores) of students assessed through the use of rating scale and benefits of those assessed through the use of psycho-productive- multiple choice test in soil contents of agricultural education curriculum.

Methodology

The correlation study was carried out in Federal Universities with Agricultural Education Programme in South East Nigeria. Correlation is adopted in a study that is interested in comparing two variables. In this study, two assessment tools: rating scale (RS) and psycho-productive-multiple-choice test (PT) were used to assess students in soil components and the costs and benefits were correlated. That is, the researchers compared the percentage scores obtained (benefit) and their relative cost using rating scale as variable 'A' and using psycho-productive-multiple-choice test as variable 'B'. The study was carried out in federal universities with Agricultural Education programme. Two schools (University of Nigeria, Nsukka and Michael Okpara University of Agriculture Umudike) were purposively selected for the study. The population for the study was 122 made up of 41 Lecturers (25 responded to the cost of ingredient, 10 determined the essentiality of the items that were later developed into rating scale items and 06 lecturers acted as raters). The performance of 81 students (42 group 'A' and 39 group 'B') was assessed after teaching them. There was no sampling due to the manageable size of the population.

Four sets of instruments were used for data collection. They were (a) questionnaire on current cost of ingredients (material inputs) of rating scale (b) questionnaire on current cost of ingredients (material inputs) of psych-productive-multiple-choice test (c) rating scale with 13 items and (d) psych-productive-multiple-choice test with 55 items.

The 13 soil skill items were developed from the literature reviewed for the study based on soil contents of Agricultural Education curriculum for universities. Each skill item was assigned a four response options of highly essential; averagely essential; slightly essential and not essential with values of 4, 3, 2 and 1 respectively. The essential skill items were converted to rating scale clusters of 13 items with each item having a four response options of high performance, average performance, slight

performance and negligible performance with values of 4, 3, 2 and 1 respectively and each value having a block loading of 25%.

The psycho-productive-multiple-choice test of 55 items were developed from the 13 cluster items of the rating scale, adopting Simpsons (1972) taxonomy of criterion reference assessment of perception 8% (5 items); set 8% (5 items); guided response 15% (8 items); mechanism 26% (14 items); complex overt response 25% (14 items), adaptation 15% (8 items) Each item had a score loading of 2%. The four sets of the instrument were validated as follows:

1) The instruments on the current cost of inputs for rating scale and that of psycho-productive-multiple-choice tests (PT) were face validated by three experts that teach soil science in Universities of Agriculture Umudike. The remarks and suggestions of the experts were integrated in developing the final instruments on costs of ingredient used to collect data for the study.
2) The structured questionnaire items developed from soil contents of agricultural education curriculum were subjected to content validation by three Lecturers selected from Enugu State Universities of Science and Technology Enugu. The responses of the experts were utilized to determine the essentiality of the items. The essential items were subjected to factor analysis to determine the weighting or hierarchy of the items. The factor loading ranged from 0.39 – 0.87 and were selected. The selection of these items was based on the statement of Meredith (1969) that any item with a factor loading of 0.35 or above is a factor; so all the 13 items developed on soil contents of agricultural education curriculum were confirmed factors. The 13 cluster items were then converted to rating scale items.
3) Fifty-five items of psych-productive-multiple-choice test (PT) developed from the 13 cluster items of the rating scale were subjected to face validation by three experts from the department of Agricultural Education, Enugu State University of Science and Technology Enugu.

To determine the internal consistency of the rating scale, skill items developed from factor loading with response options of essentiality were subjected to reliability test using Cronbach alpha method and a coefficient of 0.86 was obtained. Furthermore, the stability of the PT items was determined using Kuder Richardson (K-R20) formulae and a coefficient of 0.84 was obtained.

Data were collected by the researchers and six assistants adopting the procedure as follows:

1) The researchers administered the questionnaire on current estimate cost of inputs for rating scale and current estimate cost of ingredient for psycho-productive-multiple-choice test on 25 Lecturers in the study area in the two universities studied.
2) Six Lecturers (three per university) acted as raters.
3) Year three students was studied in each of the two universities sampled for the study (school A = 42 students school B= 39 students).

4) A copy of the cost of ingredients for rating scale was given to the teacher of agriculture in school 'A' to assemble them for practice while the researcher kept the copy of ingredients of PT as a guide in the disbursement of planned expenditure.
5) The raters were guided by the researchers on how to use the rating scale and each rater assigned to rate seven students per day and it lasted for two days in each university.
6) The year three students in school 'A' were requested to demonstrate the skills practically in the school farm or laboratory and were rated during their performance.
7) Data were collected from the raters, same day after rating.
8) The teachers teaching the soil content of agriculture curriculum in school B were requested to assist in organizing the students for the test at agreed date and time
9) The test was administered in school 'B' by the class teachers and researchers acted as supervisors and the examination lasted for 55 minutes.
10) The answer scripts were retrieved from the students and scored.

The result of the costs of ingredients of RS and PT were compared in measuring the expected performance of students. The costs of ingredients and benefits of RS and PT were correlated using Spearman rank order of correlation coefficient, percentage and sine test. In taking decision on the items of the PT, any item with percentage score of 50 or above was regarded as high benefit while any percentage score less than 50% was low benefit. With reference to the hypothesis (correlation) the correlation paradigm was utilized. Correlation values of .0.01-0.50 indicated low correlation while 0.51-0.78 indicated moderate and 0.79-0.99 showed high correlation (Pillai & Bagavathi, 2012). The Tables and figures below revealed the result of the compared instruments.

Research Question One: What is the difference between the cost of inputs for rating scale and psycho-productive multiple choice test for assessing students' performance in soil contents of agricultural education curriculum?
Data for answering research question one were presented in Table 1

Table 1: Sine test analysis of the cost of ingredients of rating scale and PT for assessing student's performance in soil contents of agriculture

S/N	Ingredients for rating scale	RS Cost		PT Cost		GAP RS-PT	Sine test
		Unit ₦	**Total ₦**	Unit ₦	Total ₦		
1	Honorarium for raters (1 rater per 7 students per day) / examiners	10,000 x 6	60,000	0.00	0.00	60,000	+
2	Honorarium for supervisor and invigilator	0.00	0.00	10,000	10,000	-10,000	-
3	Honorarium for trainers of test developer	0.00	0.00	10,000	10,000	-10,000	-
4	Validation of the items	5,000 x 3	15,000	10,000	30,000	-15,000	-
5	Accommodation and feeding of raters/examiners(2 nights)	20,000 x 6	120,000	20,000x1	20,000	100,000	+
6	Rating scale or PT question papers	100 x42	4,200	400x39	15,600	10,350	-
7	Stationeries (such as files and pens for each rater)	60	600	0.00	0.00	600	+
8	Ten Hoes (for 10 students at a time)	1,200	12,000	0.00	0.00	12,000	+
9	Ten Cutlasses (for 10 students at a time)	850	8,500	0.00	0.00	8,500	+
10	Ten Gongs	500	5,000	0.00	0.00	5,000	+
11	Ten tapes	350	3,500	0.00	0.00	3,500	+
12	Ten Pegs	300	3,000	0.00	0.00	3,000	+
13	50kg of rice paddy for demonstration	1,250	1,250	0.00	0.00	1,250	+
14	Ten empty jute bags	200	2,000	0.00	0.00	2,000	+
15	Ten mats for spreading the rice	500	5,000	0.00	0.00	5,000	+
16	A bag 50kg Fertilizer (NPK 15:15:15)	4,500	4,500	0.00	0.00	4,500	+
17	Ten pick axe	1,550	15,500	0.00	0.00	15,500	+
18	Ten 2prong metal fork	350	3,500	0.00	0.00	3,500	+
19	Ten traps	250	2,500	0.00	0.00	2,500	+
20	Ten sickles	300	3,000	0.00	0.00	3,000	+
21	Ten knives	250	2,500	0.00	0.00	2,500	+
22	11/2meter long pole	250	2,500	0.00	0.00	2,500	+
23	Ten head pans	1560	15,600	0.00	0.00	15,600	+
24	Computer service for data analysis	25,000	25,000	10,000	10,000	15,000	+
	Total		**314,650**		**95,600**	**219,050**	**+**

NB. 1$ (US dollar) = ₦387.50 (Nigerian Naira) **sign tests = + = 20 RS; - =4PT**

$812 for RS and $246.70 for PT

Data in Table 1 showed the difference in the cost of using RS and PT instruments as ₦219,050 ($565). The use of rating scale to assess student costs ₦314,650 ($812) at the rate of ₦7,492 ($19.33) per student while the psycho-productive-multiple-choice test (PT) costs ₦95,600 ($246.70) at the rate of ₦2,451 ($6.33) per student. Based on the two values, the use of PT is cheaper than that of rating scale. Table 1 further revealed the sine test of 20 for rating scale (RS) and 4 for psycho-productive-multiple-choice test (PT); indicating that there were more + than – which were in favour of RS.

Research Question Two: What is the difference between the benefit (percentage scores) of students assessed through the use of rating scale and benefits of those assessed with psycho-productive- multiple choice test?
Data for answering research question two were presented in Table 2, figure 1 &2

Table 2: Difference between the benefit (percentage score) of students assessed in soil contents of Agricultural Education using rating scale and similar students assessed using PT

S/N	Assessment Items Rating Scale	PT items per RS item	Benefit of RS	Benefit of PT	Difference (Gap) %	Sign test (RS-PT)
1	Assemble tools for collecting soil sample	6	75.70	57.30	18.40	+
2	Clear grass, park, burn and stump	3	66.70	36.67	30.03	+
3	Dig appropriate areas of the farm to collect soil sample	4	51.70	30.75	20.95	+
4	Determine subsurface temperature of the soil	4	65.30	33.25	32.05	+
5	Collect soil samples with appropriate implement (auger)	5	66.20	39.25	26.95	+
6	Pasteurize the soil to kill insect eggs and weed seeds	3	72.70	21.00	51.7	+
7	determine soil textural class	4	88.30	46.78	41.52	+
8	Determine soil colour	4	70.50	33.25	37.25	+
9	Determine soil salinity using electric conductivity	3	72.00	19.00	53	+
10	Determine soil pH	3	62.20	25.00	37.2	+
11	Test for macro nutrients	7	88.50	31.75	56.75	+
12	Test for micro nutrients	5	83.30	43.50	39.8	+
13	Interpret result	4	70.30	20.75	49.55	+
	Average	**55**	**71.80**	**33.70**	**36.70**	**+**

Data in Table 2 revealed that the students assessed with rating scale performed higher than those assessed using psycho-productive multiple-choice test. This was indicated by the gap scores which ranged from 18.40 -56.75. The Table also showed a positive sign-test in each of the 13 cluster items; indicating high performance in favour of rating scale. Averagely, the benefit of students assessed with rating scale was higher (71.80%) than the benefit of students assessed using psycho-productive multiple choice test (33.70%) with a gap of 36.70% and a positive sign test in favour of rating scale. (See fig. 1 and fig 2)

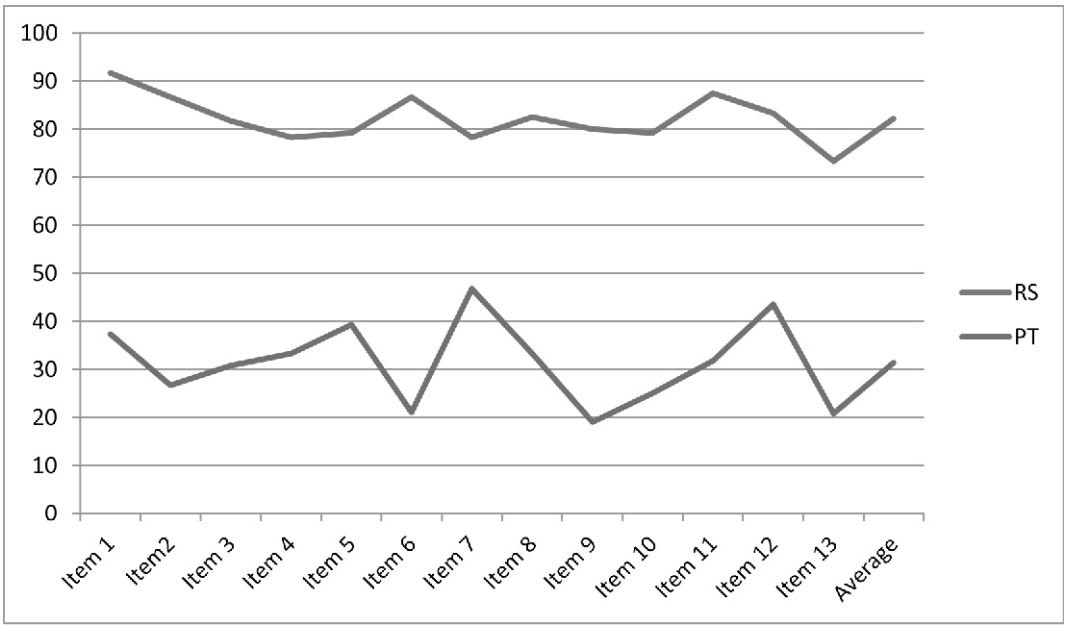

Fig 1: A graph indicating the difference in students 'performance in each of the items

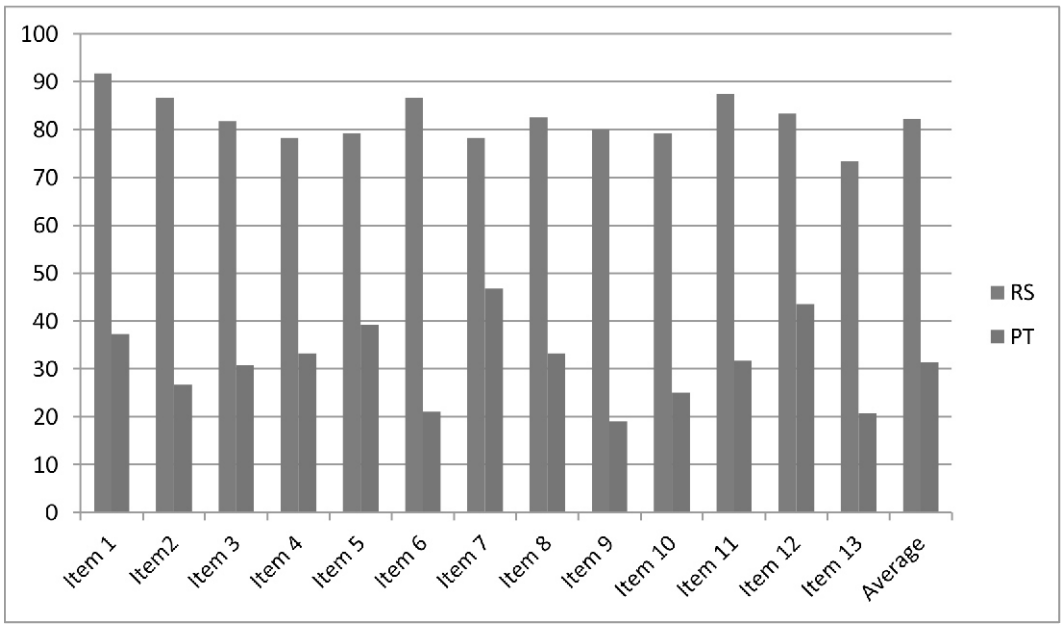

Fig 2: A bar-chart indicating the difference in students' performance.

Hypothesis One: There is no significant relationship between the benefit of students assessed through the use of rating scale and those assessed with psycho-productive-multiple choice test
Data for testing hypothesis one were presented in Table 3

Table 3: Correlation of benefits of students' performance assessed using rating scale and benefits of similar students assessed using psycho-productive- multiple-choice test

S/N	Assessment Items Rating Scale	Benefit of RS	Rank	Benefit of PT	Rank	D	D^2
1	Assemble tools for collecting soil sample	97.70	1	37.30	4	-3	9
2	Clear grass, park, burn and stump	86.70	3	26.67	9	-6	36
3	Dig appropriate areas of the farm to collect soil sample	81.70	7	30.75	8	-1	1
4	Determine subsurface temperature of the soil	78.30	11	33.25	5	6	36
5	Collect soil samples with appropriate implement (auger)	79.20	9	39.25	3	6	36
6	Pasteurize the soil to kill insect eggs and weed seeds	86.70	3	21.00	11	-4	16
7	determine soil textural class	78.30	11	46.78	1	10	100
8	Determine soil colour	82.50	6	33.25	5	1	1
9	Determine soil salinity using electric conductivity	80.00	8	19.00	13	-5	25
10	Determine soil pH	79.20	9	25.00	10	-1	1
11	Test for macro nutrients	87.50	2	31.75	7	-4	16
12	Test for micro nutrients	83.30	5	43.50	2	3	9
13	Interpret result	73.30	13	20.75	12	1	1
						$\sum D^2$= 285	
						rho = 0.18	

\The result in Table 3 revealed a low correlation (rho=0.18) between the benefits of the two groups of students assessed with RS and PT.
The study found out that:

1. difference exist in the cost of using RS (314,650) and PT (95,600) instruments with a gap of 219,050 (314650 – 95,600) in favour of PT. This means that the use of PT is cheaper than that of RS in assessing students.

2. the benefit (percentage score) of students assessed with rating scale was higher (71.80) than the benefit of students assessed using psycho-productive multiple choice test (33.70) with a gap of 36.10 in favour of RS.
3. the hypothesis tested revealed that low correlation exist between the benefits of the two groups of students assessed.

Discussion of Findings

The study found out that it costs ₦219,050 ($565) for a teacher to assess students with rating scale while psycho-productive multiple-choice test costs less. Secondly, there is higher benefit (percentage score) in using RS for assessing students than PT. This is because students assessed through rating scale performed better than those assessed using PT.

The findings of the study were in agreement with the findings of Okpala, Onocha and Oyedeji (1993) that students assessed with rating scale perform higher than any other assessment instrument. The high performance of student assessed with RS as adduced by Okpala, Onocha and Oyedeji (1993) arises from the block loading syndrome which gives a student 25% (as against 2% in PT). Other limitations of RS instrument are (a) halo effect (b) error of central tendency (c) leniency or generosity error (Okpala, Onocha and Oyedeji (1993) and Olaitan and Ali, 1997). Halo effect refers to the appearance of the ratee (students), tools used in performing the skill, personal attitude of the ratee. Halo effect indicates that judges, anxiety, fear of failure or enticing the rater could make the rater to focus on the ratee instead of the trait under consideration; thereby leading to unmerited low/high score. The error of central tendency as explained by (Okpala, Onocha and Oyedeji (1993) and Olaitan and Ali, 1997) leads a rater to deliberately avoid the two extremes of the rating scale options and concentrating on the middle position in order to "play safe" in an odd numbered rating options. To overcome the "play safe" error, the researchers decided to use 4-point (even numbered) rating options but this also created "shifting error' expressed by leniency or generosity error. The leniency or generosity error occurs where the rater kindly and generously favours a particular ratee (student) due to personal or unexpressed reasons. In this study, such favour resulted from shifting from negligible to slight performance or from slight to average; each shifting attracted a block loading of 25% which was another limitation observed by the researchers. The block loading error in this study is illustrated in fig 3

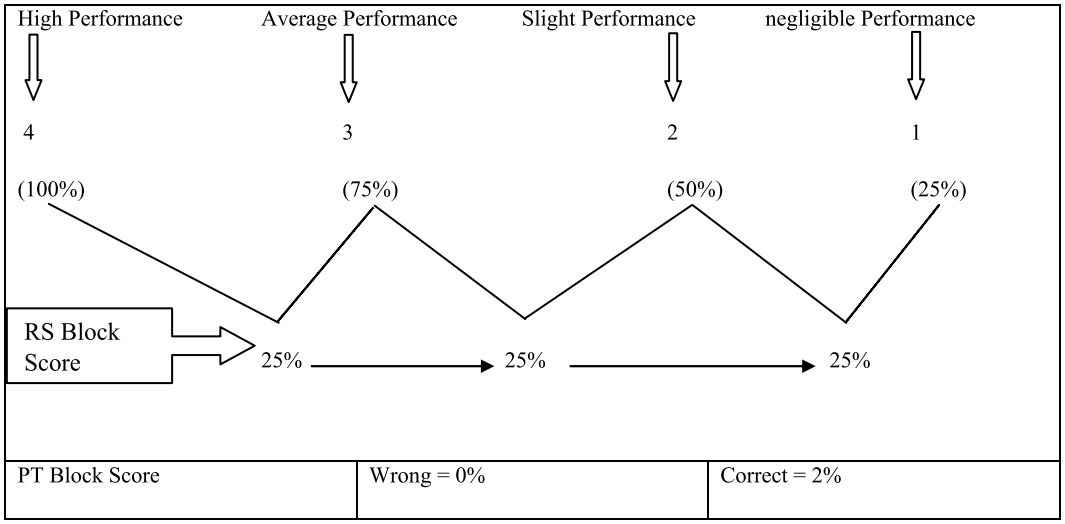

Figure 3 block loading of 25% in RS as against 2% in PT.

From the above, the least score for any student that attempted the examination, using RS was 25% but 0% in case of PT. In other words, if a student appears for PT but did not get any answer correct, he/she scores 0% but scores 2% (marks) for any correct answer while in RS, if a student presents an appearance with a negligible performance he/she scores 25% which is highly exaggerated, thus a serious limitation of RS. Another limitation of RS as observed by the researchers was that it is difficult to make use of rating scale to assess all the soil content area within a period of three hours of examination this limitation is a credit to PT

In this study, it was observed that the low score of the students assessed using PT resulted from the inherent qualities which were firstly that PT assessed the communication language of each student; that is, ability to read and interpret the questions in the direction expected; secondly, PT also assessed the ability of students to understand body movements or actions such as astride, bend, stoop, hand-on-knee and others which were vividly expressed in the items. The psycho-productive multiple-choice test do not ignore these body movements in form of commands that were assumed in rating scale though observed by raters but without any explanations. Thirdly, the items (55) were well spread out but given high frequency to critical areas of skill learning such as guided response, mechanism and complex-overt response as indicated in Simpson (1972) table of specification and adopted by this study. The researchers further observed that students (in group B) were exposed to psycho-productive multiple-choice test the first time in their life which could have

contributed to low performance while the teachers that rated students (in group A) have been using rating scale occasionally for contiguous assessment purpose.

Conclusion

In conclusion, the cost of assessment of a student using RS is more expensive than that of the PT although RS has certain limitations, which are credit to PT. This means that if a teacher is interested in skill acquisition by the student PT has to be used while a teacher that is interested in score with little or no skill development need RS bearing in mind the limitations of RS and the cost. The findings of the study, therefore suggests that PT could perform the same job of RS without the limitations.

Recommendation

It was recommended that

1. If the teacher is interested in skill development of learners, PT has to be used without attention to benefit, this is because it is cost effective in skill development. PT should, therefore, be used by lecturers in assessing students but with strong emphasis for training of teachers in the development of the skills and skill-items in vocational subjects. Simpsons taxonomy of educational taxonomy should be adopted in setting questions for assessing students because it has less cost
2. When there is enough money, RS can be adopted by teachers due to its high benefit in terms of high scores despite the high costs.

Reference

Ali, A, (2006). *Conducting research in education and the social sciences*. Enugu. Tashiwa Networks Ltd

Asogwa, V. C. (2014). Capacity building needs of lecturers in soil fertility and fertilizer management practices for effective teaching of students in colleges of education in south-east Nigeria. *Unpublished PhD thesis*, university of Nigeria, Nsukka

Brady, N.C. & Weil. R.R. (2010). *Elements of the nature and properties of soils*. New York, person education international

Dilip, K.D. (2012). *Introductory soil science*. New Delhi: Kalyani Publishers.
Ifeanyieze, F.O. (2012). Skill improvement needs of teachers of agricultural education program in soil conservation in Colleges of Education in South-Eastern Nigeria. *Unpublished Ph.D.* Thesis. Department of vocational teacher education, university of Nigeria, Nsukka.
Kellegham, I & Grenary, V. (2001).using assessment to improve the quality of education. Paris. UNESCO international Institute for Educational Planning. Retrieve on 15/05/15 from http://www.unesco.org.brief.
Layide and Olayemi (2015). State of food insecurity in the world. retrieved on 22/3/2021 from www.reliefweb.int.report
Meredith G.M (1969). Dimension and faculty of cost evaluation. *Journal of Psychology*, 5,56-61.
Okeme, I. (2011). Development and validation of psycho-productive skill multiple choice test items in agricultural science for students in secondary schools. *Unpublished PhD thesis* submitted to the department of vocational education, University of Nigeria, Nsukka.
Okpala, P.N., Onocha, C.O & Oyedeji, O.A (1993). *Measurement and evaluation in education.* Jattu-uzairue: Stirling-Horden Publishers Nig.Ltd.
Oladeinde Olawoyin (2019). How lack of apprentices, emergence of graduate artisans affect Nigerian's SMEs. Premium Times. Retrieved on 18/07/2020 from https://www.premiumtimesng.com
Olaitan, S.O. & Ali, A. (1997). *The Making of Curriculum. Theory, Process, Product and Evaluation*. Onitsha Cape Publishers Ltd.
Philip, J.W., John, W.C., Maria, C.D. & Rosario, G.M. (2012). Soil Management for sustainable agriculture. *Applied and environmental soil science*. Accessed on 17th December, 2015 from http://dx.doi.org10:1155/2012/850739.
Pillai, R.S.N & Bagavathi, M.A. (2012). *Statistic: theory and practice*. New Delhi. S. Chand & Company Ltd.
Simpson, E.J. (1972). *The classification of educational objectives in the psychomotor domain.* Washington. D. C: Gryphon House.
United States Department of Agriculture (USDA, 2014). Natural Resources Conservation Service Soils. Retrieved on 2/5/2016 from www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142
Warmbrod J. R (1977). *Criterion-referenced instruments for assessment of specialized vocational agriculture programs*: Final report. Ohio State Dept. of Education, Columbus. Div. of Vocational Education
Wiseman, J.D (2010).The Moral imperative and social rationality of government-guaranteed employment and re-skilling. *Review of Social Economy, 68:1, 35-67, DOI:* 10.1080/0034676090296840