EFFECT OF PSYCHO-PRODUCTIVE MULTIPLE CHOICE TEST ITEMS ON STUDENTS' PERFORMANCE IN SOIL AND WATER CONSERVATION EDUCATION IN NIGERIA UNIVERSITIES FOR NATIONAL CHANGE

FLORENCE OBIAGELI IFEANYIEZE
DEPARTMENT OF AGRICULTURAL/HOME SCIENCE EDUCATION, MICHAEL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE, ABIA STATE

CLARA UKAMAKA NWANKWO
DEPARTMENT OF AGRICULTURAL EDUCATION, UNIVERSITY OF NIGERIA, NSUKKA
&
EDWARD. C. ISIWU
DEPARTMENT OF AGRICULTURAL EDUCATION, UNIVERSITY OF NIGERIA NSUKKA

Abstract
One of the objectives of agricultural education is to impact skills on the learners. It was observed that graduates of agricultural education from universities find it difficult to earn their living in agriculture practical activities aside white-collar jobs. The researchers interviewed some of these graduates and found out that they were assessed cognitively which resulted to their high grades but with no corresponding competence. It was therefore necessary to assess their competency with psycho-productive multiple choice test items and re-assessed them over time for effectiveness. The study was carried out to determine the effect of psycho-productive multiple choice test items on students' performance in soil and water conservation education in Nigeria universities for national change. The study adopted quasi experimental research design. Two research questions and two null hypotheses guided the study. The population waw386 students from 4 universities in south East that offer Agricultural Education comprising Alex Ekwueme University Ebonyi 28, Enugu State University of Science and Technology 101, Michael Okpara University Umudike 155 and University Nigeria Nsukka 102. Purposive sampling techniques was used to select 73 year three students. Year three students were considered because they are offering soil and water conservation education at this level; others years (100 and 200) are yet to offer the course and year 4 are at the verge of graduation. Psycho-productive multiple-choice test of 80 items were validated with acceptable reliability of 0.97 and used for data collection by three assistants. Data were analyzed with percentage to answer research questions while ANCOVA statistics were used to test null hypotheses at 0.05 level of significance. The findings of the study revealed that students performed well over time indicating that they will do well in the world or work. It was therefore recommended that students of agricultural education should be assessed with psycho-productive multiple choice test items for effectiveness.

Key words: - soil, water, conservation, performance, psycho-productive

Introduction

An important aspect of gift of nature that serves as a base for most activities on earth is soil. Soil is unconsolidated earth surface formed through environmental factors of climate (water and temperature effects) in addition to macro and micro-organisms acting on parent material over a period of time (Jon and Jackie 2015). Soil refers to layers of loose organic matter that are formed by physical, chemical and biological processes of weathering (Harold 2017). Soil is unconsolidated layers of mineral and organic matter formed from rock weathering and serves as a base for plant growth. Soil provides different crucial services to human and entire planet as it anchors plants, purifies water, captures and stores carbon and aids food security in the world (ClientEarth, 2020). Soil is a medium for plant growth, supporting animal and human activities, act as reservoir for nutrients and water by providing plant's nutrient needs throughout their growth period (Nortcliff, Schulte-Bisping, Bunnick & Litz, 2017). Food & Agricultural Organization Food and Agricultural Organization (FAO) (2015) stated that soil provides nutrients, and mineral to plants by translocation of materials received such as fertilizers to upper part of the plant with the help of soil water

Water is a compound containing hydrogen and oxygen elements existing in gaseous, liquid or solid state (Zumdahl, 2022). Water is a substance, desired for economic purposes (Feitelson, 2012) and required for agricultural uses as in cleaning, growing of crops and rearing of animals. Every living thing needs water for healthy living. Water taken by farmers' households makes their body function properly for good health and active work (Mayo, 2022). Four areas water is used in agricultural production as indicated in Encyclopedia (2022) are growing of crops, supply to livestock, laborers, cleaning farm buildings, equipment and processing products. According to Food and Agricultural Organization (FAO) (2017) water supports maintenance of healthy ecosystems as it enables continuous agricultural production and industrial development. In the context of this study water is an essential resource for maintaining health of farmers and carrying out most agricultural activities. It therefore, means that water which is essential for survival of all ecosystems must be available for proper functioning and management of agricultural activities. To ensure effective and continuous agricultural activities, both soil and its water must be subjected to conservation.

Conservation is a careful use of natural resources in other to maintain its availability over a long period. Conservation is the act of protecting earth's natural resources like soil and water for current and future generation (Encyclopedic, 2022). Conservation is act of preventing wasteful or over-use of a resource (Sandbrook, 2015). In this study conservation is a careful use and management of soil and water to ensure their availability for current and future generation and for continued agricultural activities. It therefore, means that both soil and water must be conserved to ensure that each continues to exist for this and future generation. Soil conservation requires a combination of practices that protect topmost part of the earth from degradation (Johnston 2023). Soil conservation makes use of farming methods or practices that keep land free from degradation, erosion or depletion (Robinson, 2023). The author further stressed that soil conservation is prevention of soil loss through erosion, reduced fertility caused by over usage, acidification, salinization or other chemical contamination. In this study soil conservation

is a method or practices adopted to protect and keep soil from degradation through erosion. Dumitrescu (2016) stated that soil conservation practices include artificial and natural windbreak using shrubs to reduce effect of wind (planting crops to reduce erosion); mulching (covering bare soil with dried plants materials to help the soil retain moisture), contour barrier (building bars or wage with crops, stones or grasses to prevent erosion); terracing (slope plane cut into successive receding platforms to reduce water flow). Osman (2014) indicated that soil conservation measures comprise of soil amendments, de-compaction, mulching, cover cropping, crop rotation, green manuring, contour farming, strip cropping, alley cropping, surface roughening, terracing, sloping agricultural land technology, dune stabilization among others. Most of these practices also enhance water conservation.

Water conservation is the act of reducing usage of water and recycling of water for different purposes such as domestic and agricultural uses (Balasubramania, 2019). Plant Science Post (2017) stated that water conservation help farmers produce more food at reduced cost. Water conservation practices in agriculture can be achieved through drip irrigation (capturing and storing water, irrigation scheduling, growing drought tolerant crops, practicing dry farming rotational grazing, cover cropping, conservation tillage, organic farming. Field leveling, water reuse, drip/buckets or gated pipe irrigation and subsurface irrigation are some of the methods of water conservation in agriculture (Foodwise, 2017). This is because Soil and Water are natural resources that most ecosystems require for their survival.

Soil and water conservation is taught as a course in universities in Nigeria. The aim of the course is to equip students with practical skills in preventing, protecting and careful use of soil and water resources to maintain their continuous availability. Lecturers of agricultural education are expected to teach students of 300 levels soil and water conservation education and at the end of teaching, subject them to assessment to know the extent they have learnt based on their objectives.

Assessment is a process that educators utilize to measure, evaluate, and document academic readiness, learning progress, skill acquisition, or educational needs of students (Nwankwo, Ifeanyieze & Isiwu, 2021). Assessment is the process of obtaining information about a person, subject or thing, based on certain characteristics (Ifeanyieze, Bakare, & Olaitan, 2023). The authors further explained assessment as a process of measuring competencies acquired or interest in a course or subject by making use of appropriate instrument such as tests, questionnaire, interview or observational schedules with the aim of making valid judgment on student's activities. Assessment is a process of getting information in other to make valid judgment on student's performance.

Performance is a process of evaluating and documenting individual's work activities in a particular subject area. Performance is application of knowledge, skills, at one's disposal to finish a particular work as related to this study (Privacy Policy-Educba, 2020). Performance is the extent to which students have attained their short-term or long-term educational objectives and is measured by either continuous assessment or cumulative grade point average (Open Access Research, 2022). Performance refers to demonstrated

competencies gained in a given subject which is determined by scores awarded by teacher based on educational objectives to be achieved over a specific period (Kumar, Agarwal & Agarwal, 2021) Performance is therefore, determination of the extent to which students are able to demonstrate skills in soil and water conservation education over-time to which scores are awarded after exposing them to specific course content.

The course content of soil and water conservation education is in the area of psychomotor domain which requires skill performance and assessed in line with. Simpson's recommendation. Simpson (1972) stated that psychomotor domain demands physical movement, coordination, or use of motor skill areas requiring speed, accuracy, procedures or techniques for successful execution. Simpson grouped these skills into seven levels which are perception, set, guided response, complex overt response, mechanism, adaption, and origination. Each of the seven levels has associated key verbs used for developing psycho-productive multiple choice test items.

Psycho-productive multiple choice test items is an assessment instrument used for measuring student's performance in practical activities. The items are used as an instrument for assessing extent to which students can demonstration observable skills taught by teacher (Danjuma & Umaru, 2017). Psycho-productive multiple-choice test is an instrument for determining the extent to which students can exhibit their practical competence in a particular area (Danjuma, Dimgba, Krene & Abdulahi, 2019). Psycho-productive multiple-choice test is a detailed examination of observable activities associated with completion of a required function or unit of work (Onanuga, Adebola, & Kehinde, 2021). Therefore, psycho-productive multiple-choice test is an instrument for measuring the level at which students can demonstrate their competence in curriculum contents areas of soil and water conservation education.

Psycho-productive multiple-choice test is necessary in all the learning situations especially where students are exposed to practice skills and are expected to perform these skills in occupations like agricultural activities as the test emphasize performance which is the most important aspect of learning for living (Onanuga, Adebola, & Kehinde, 2021). This means that students are expected to demonstrate observable competencies in soil conservation education even after graduation in the course in the study area.

However, the researchers observed that graduates of agricultural education find it difficult to conserve the soil or help farmers in that direction even in their environment. This made the researchers to interact with some of the graduates and found out that they were assessed cognitively which was confirmed with pass questions of previous examinations. This affects their performance because they scored high marks without corresponding competency which makes them find it difficult to earn their living in agricultural practical occupations aside white-collar jobs. The researchers interviewed some of these graduates and found out that they were assessed cognitively which resulted to their high grade but with no corresponding competence. Simpson (1972) emphasized performance skills in teaching and assessment in equipping students for employable skills. Simpson's taxonomy of educational objective, when used to assessed learners' psychomotor skills with psycho-productive multiple choice test items in agricultural education course like

soil and water conservation education, graduate of agricultural education could acquire needed skills to help them earn their living through agricultural practical activities instead of waiting for white collar jobs from the government. This study therefore, determined effects of psycho-productive multiple choice test items on student's performance in soil and water conservation education in universities in Nigeria for national change. Specifically, the study determined: -

1. performances of students assessed with psycho-productive multiple-choice test items in soil and water conservation education at pretest and post-test.
2. performance of students assessed with psycho-productive multiple-choice test items over time (6months) in soil and water conservation education.

Methodology

The study was carried out to determine effect of psycho-productive multiple choice test items on students' performance in soil and water conservation education in Universities in Nigeria for national change. The study adopted quasi experimental research design and was carried out in universities in south East Nigeria. Quasi experimental research design establishes cause-and-effect relationship between independent and dependent variables with subjects assigned to groups based on non-random criteria (Lauren, 2022). The population for the study was 376 students of Agricultural Education from four universities in South East that offer the course. These universities were Alexander Ekwueme University Ndufu-Alike 28, Enugu State University of Science and Technology 101, Michael Okpara University Umidike 155 and University of Nigeria Nsukka 102.

Purposive sampling techniques was used to select 73 year three students from the four universities, as follows Alexander Ekwueme University Ndufu-Alike 4, Enugu State University of Science and Technology 11, Michael Okpara University Umidike 35 and University of Nigeria Nsukka 23. Psycho-productive multiple choice test items (PMCTI) of 80 items developed in soil and water conservation education curriculum contents was the instrument used for data collection. Each of the test items had four options with one as correct answer and the remaining three being distracters. Each correct response attracted 1 mark thus the maximum score was 80 marks but converted to 100 percent (%). The instrument was content validated by three experts, two from Agricultural Education Department and one from Soil Science Department all from University of Nigeria Nsukka. The reliability of the test items was established using Kuder-Richardson (KR-20) method which yielded a coefficient of 0.87. Data was collected by the researchers and four assistants as follows

1. The researchers contacted lecturers in each University. The assistants were lecturers who teach year three students in all the selected universities.
2. Prior to the assignment, research assistants were instructed on how to collect data from the students.
3. Each of the assistant was requested to pre-test students before teaching. The researchers acted as invigilators during the examination which lasted for 1hour 40 minutes.
4. The pre-test scripts were retrieved and marked by the researchers.
5. The students were exposed to soil and conservation practices using lecture notes prepared by researchers for a period of three months.

6. The assistants were further requested to assess the students using the developed and reshuffled psycho-productive multiple choice test items
7. The scripts were collected and scored by the researchers making use of already developed key.
8. After six months of the post-test, the assistants were requested to re-assess the students with the same questions although the items were further reshuffled.
9. The scripts were collected, mark by the assistants using the same key.

The data was then analyzed using percentage to answer research questions while (ANCOVA) statistic was used to test the null hypotheses at 0.05 level of significance and degree of freedom (df) as 71. In taking decision any item with 50 and above was regarded as pass but fail if below. With reference to hypotheses tested any value below 0.50 indicated significant difference but not significant if value was less than 0.05.

Result

The result of the study was generated from the research questions answered and presented in tables 1-3

Research Question One

What was the performances of students assessed with psycho-productive multiple-choice test items in soil and water conservation education at pretest and post-test?

Table 1: Presented data for answering research question one, performance of students assessed with psych-productive multiple choice test items in soil and water conservation education at pretest and post-test.

S/N	Psycho-productive Levels	Pre Test					Post-Test 1					Diff.	Rmk
		AEU	ESU	MOU	UNN	X	AEU	ESU	MOU	UNN	X		
1	Perception (10 items)	30	40	30	40	**35**	40	50	60	60	**53**	**18**	Positive difference
2	Set (10 Items)	30	30	50	40	**38**	60	40	50	60	**53**	**15**	"
3	Guided Response (19 Items)	37	32	32	37	**35**	47	47	53	58	**51**	**16**	"
4	Mechanism (14 Items)	36	43	43	36	**40**	50	57	64	50	**55**	**15**	"
5	Complex Overt Response (20)	40	40	35	45	**40**	55	60	50	60	**56**	**16**	"
6	Adaptation (5 Items)	40	40	40	40	**40**	60	40	60	60	**55**	**15**	"
7	Origination (2 Items)	50	50	50	0	**38**	50	100	50	100	**75**	**37**	"
Total		38	39	40	34	**38**	52	56	55	64	**57**	**19**	"

Data in Table 1 showed that students performed poorly in pre-test (35-40). The students performed better in the post test (53-75) with pass in all areas. All the scores in pre-test and

post-test had a positive difference which ranged from 15 to 37 indicating that students did well in the post test due to their exposure in the course contents

Ho_1 There is no significant difference in the mean performance of students assessed with psycho-productive multiple choice test items in soil and water conservation education.

(ANCOVA test results, interpret it using the GROUP row)

Table 2: Analysis of Covariance on the mean achievement scores of students in the four universities studied, assessed with psycho-productive multiple-choice test in pre-test and post-test.

Tests of Between-Subjects Effects

Dependent Variable: POST_TEST1

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	29.626[a]	4	7.406	.976	.427
Intercept	1112.689	1	1112.689	146.620	.000
PRE_TEST	8.680	1	8.680	1.144	.289
GROUP	17.524	3	5.841	.770	.515
Error	516.045	68	7.589		
Total	171630.000	73			
Corrected Total	545.671	72			

a. R Squared = .054 (Adjusted R Squared = -.001)

Table 2 displayed the significant levels of students assessed with psycho-productive multiple test items in the four universities studied (UNN, ESUT, MOUA and FUNAI). Data shows that the F-ratio of .770 with p-value 0.515 is greater than 0.05 level of significance, the null hypothesis of no significant difference is accepted.

Research Questions Two

What was the performance of students assessed with psycho-productive multiple-choice test items in soil and water conservation education over time I e 6months?

Table 3: Presented data for answering research question two, performance of students assessed with psych-productive multiple choice test items over time (6 months) in soil and water conservation education.

S/N	Psycho-productive Levels	Post-Test 1					Post-Test 2					Diff.	Remark
		AEU	ESU	MOU	UNN	X	AEU	ESU	MOU	UNN	X		
1	Perception (10 items)	40	50	60	60	**53**	40	40	50	60	48	**5**	Retention
2	Set (10 Items)	60	40	50	60	**53**	50	40	50	50	48	**5**	"
3	Guided Response (19 Items)	47	47	53	58	**51**	42	42	47	53	46	**5**	"
4	Mechanism (14 Items)	50	57	64	50	**55**	57	64	64	43	57	**2**	"
5	Complex Overt Response (20)	55	60	50	60	**56**	45	60	55	60	55	**1**	"
6	Adaptation (5 Items)	60	40	60	60	**55**	60	40	60	40	50	**5**	"
7	Origination (2 Items)	50	100	50	100	**75**	50	100	50	100	75	**0**	"
Total		52	56	55	64	**57**	**49**	**55**	**54**	**58**	**54**	**3**	"

Table 3 revealed that students performed better in the re-assessed test (over time, 6 months) than in the pre-test in all the seven levels. These results indicate that re-assessed (over time 6 months) yields better results on students' retention than the first and when compared with second test the students also performed better. This indicate that the students retained the skills gained.

HO_2

There is no significance difference in the mean responses of students re-assessed overtime (6 months) with psycho-productive multiple-choice test in soil and water conservation education.

Table 4: Analysis of Covariance on the mean achievement scores of students in the four universities studied, assessed with psycho-productive multiple-choice test over time (6 months)

Tests of Between-Subjects Effects

Dependent Variable: POST_TEST2

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	30.229[a]	4	7.557	1.049	.388
Intercept	1073.563	1	1073.563	149.079	.000
PRE_TEST	6.496	1	6.496	.902	.346
GROUP	21.781	3	7.260	1.008	.395
Error	489.689	68	7.201		
Total	170155.000	73			
Corrected Total	519.918	72			

a. R Squared = .058 (Adjusted R Squared = .003)

Data in Table 4 shows F-ratio of 1.008 with p-value of 0.395 which is greater than 0.05 level of significant. However, the null hypothesis of no significant difference is accepted.

Discussion of the findings

The findings of the study revealed that the students performed better in the same test items when assessed them over time, (six months). This shows that the psycho-productive multiple choice test items assessed their psychomotor, which was represented in the test items. It equally revealed that the students can retain, demonstrate observable skills taught and perform the same under conditions similar to working environment. This findings are in consonant with the findings of Danjuma and Umaru (2017) who carried out study on Psycho-productive skills multiple choice test items for assessing students in mechanical engineering craft in technical colleges in Nasarawa State, where it was found that students performed better when assessed with psycho-productive multiple choice test items due to its nature to assess psychomotor domain such the students could demonstrate skills taught and perform them under conditions similar to working conditions of the trade. The findings of the study were also in line with the findings of Ifeanyieze and Okeme (2017) where the authors found that 147 items were valid while 42 items in animal, 36 in crop and 32 in agricultural technology had average psychometric properties and the null hypothesis revealed that there was significance difference in the performance of the high versus low ability groups. In the same way the findings of this study were in agreement with the findings of Nwankwo, Ifeanyieze and Ishiwu (2021) in a study on efficacy of evidence-based test for assessment of performance of agricultural science students in cassava processing in Enugu State where the authors found that the group of students taught practically and assessed with evidence-based test items which assessed their psychomotor domain performed better than their counterparts taught theoretically and assessed cognitively.

Conclusion

The study examined the effects of psycho-productive multiple choice test items on the achievement of students in soil and water conservation education in Nigeria universities. From the analysis of data, it was pertinent to conclude that student assessed with psycho-productive multiple-choice test items performed well and retained knowledge gained, which revealed by post-test 1 and 2 respectively. Again, from the study assessing psychomotor domain will help to achievement the objectives of agricultural education as a practical oriented programme. Assessing only cognitive domain of students in agricultural education courses made the realization of skill development of students of agricultural education unachievable, hence after graduation the students cannot engage in agriculture practical activities aside white-collar jobs by government. This situation called for research on one of the instruments of assessment of students' performance skills (psycho-productive multiple choice test items) to fill the gap created by assessment in agricultural education towards achieving its objectives.

Recommendations

Based on the findings of the study, the following recommendations were made.

1. Teachers should assess students with instrument that are capable of testing their competence emphasized by Simpson Taxonomy of education in teaching skill-

oriented subject like agricultural education courses.

2. Psycho-productive multiple test items should be used in assessing students' performance in skill-oriented subjects like agricultural education courses.
3. Agricultural education students should be exposed to practical activities during teaching and learning to enhance their performance and to enable them engage in agriculture practical activities aside white-collar jobs.
4. Agricultural education students should also be trained on the use and proper handling of tools/materials to facilitate the process of transmitting knowledge, ideas and skills.
5. University administrators should equip and enrich agricultural education laboratories with appropriate facilities to enhance students' utilization of instructional materials to concretize learning of agricultural education concepts.

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