DEVELOPMENT AND VALIDATION OF PSYCHOMOTOR SKILLS TEST FOR ASSESSING STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME IN MICHEAL OKPARA UNIVERSITY OF AGRICULTURE, UMUDIKE.

BY

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ABSTRACT

The study was carried out to develop and validate psychomotor skills test for assessing students during students industrial work experience scheme in Michael Okpara University of Agriculture, Umudike.. Two research questions were posed for the study. The study adopted the research and development design. The population of the study was all Bachelor of Agriculture (B.Agric) programme students involved in students industrial work experience scheme in the 2016/2017 academic session in Micheal Okpara University of Agriculture, Umudike. The sample of the study was 400 Students which were selected from the three college offering Bachelor of Agriculture(B.Agric) programme, as the sample size was selected using the proportionate stratified ramdom sampling technique purposively selected. The instrument for data collection was the Psychomotor Skills Test For Students Industrial Work Experience Scheme (PSTFSIWES). The instrument was face and validated using the rotated component matrix to establish the construct validity. Internal consistency was established the using the cronbach alpha. The result of the analysis shows that the psychomotor skills test for assessment students during students industrial work experience scheme in universities of agriculture was valid since the factor loading on the instrument from 0.35-0.70 and the reliability of the instrument which was determined by cronbach alpha was found to range from 0.71-0.86. Based on the findings of the study, it was recommended that the universities should integrate the use of the instrument for students in Agricultural programme and the instrument should be adopted and adapted for use in other practical-oriented courses for process assessment of students in psychomotor skills.

Keywords: Development and validation, psychomotor skill test and SIWES

INTRODUCTION

Agriculture is that kind of activity which joins labour, land and soil, live animals, solar energy and so on. It remains one of the tool that can be used to stimulate rapid socio-economic development of Nigeria. It was on this premise that Joshua, (2007) describes Agriculture as been the mainstay in any Nation's economic and social development. The importance of agriculture to Nigeria development cannot be overemphasized as it will ensure food self-

sufficiency for Nigeria which will help to reduce Nigeria overdependence on imported food. Agriculture also contributes to about 68% of the labour force in Nigeria, as it is also the principal sources of livelihood in Nigeria (Philip, Nkonya, Render & Oni, 2008).

The importance of Agriculture to Nigeria's development and its consolidation on rapid socio-economic development, poverty reduction, provisions of employment of the teeming youths, development of rural areas, reduction of rural urban migration amongst others made the country deemed it necessary for the establishment of specialized universities of agricultures. Nigeria presently has three Universities of Agriculture which are (i) the Federal University of Agriculture, Abeokuta. (ii) Federal University of Agriculture, Markurdi (iii) Micheal Okpara university of Agriculture, Umudike. These three universities have common philosophy guiding its establishment which amongst other things include to train manpower in different aspects of agriculture for national development and the producing graduates of Bachelor's degrees in Agriculture(B.Agriculture) who will be competent and abreast with the new innovations in agriculture needed for rapid agricultural development.

The different courses of Bachelors of Agriculture in which students in universities of agriculture can study in other to be awarded a Bachelors degree in Agriculture includes fisheries, agricultural economics, agronomy, soil science, animal science and production, agricultural extension, plant health management amongst others. These courses fall under two broad categories which are crop production and animal production. Thus for the students to be awarded Bachelors of Agriculture in any of the courses, the student must undergo a five year programme which include four years of cognitive learning and one year of psychomotor learning progamme which is referred to as the Students Industrial Work Experience Scheme (SIWES). This

progamme is designed to enable the student acquire the needed psychomotor skills in carrying out agricultural activities.

The Students Industrial Work Experience Scheme (SIWES) is a programme in the tertiary education that is designed to equip student with work skills, methods and processes of an industry(ITF,2003). Corroborating this, Osimen & Nworji (2010) stated that the Student Industrial Work Experience Scheme is a skill training programme designed to expose and prepare the student of higher institutions for work situations, as they exist in the world of work. The authors noted that the scheme provides students with opportunities to familiarize themselves with and expose them to tools equipment and machines that are not available in their various institutions but which will be used after graduations. Hence the scheme is meant to develop the students with the psychomotor skills needed to strive in the contemporary Nigeria's world of work.

The objectives of Students Industrial Work Experience Scheme (SIWES) in relation to Bachelor of Agriculture programme include: to produce an avenue for Agricultural Science students to acquire agricultural experiences and skills required for success in agricultural occupations; to prepare agricultural Science students for working in agricultural enterprises after graduation; to expose Agricultural science students in handling agricultural tools, equipment and machines that are necessary for carrying out agricultural productions; to help Agricultural Science students for easier transition from school to agricultural occupation; and to afford Agricultural Science students the opportunity of applying the knowledge gained in theoretical work into practical work in agricultural industry (Industrial Training Fund, 2003).

The Students Industrial Work Experience Scheme is usually undergone by students for a period of three months, six months or an academic session as the duration vary by discipline or

the institution. For the Agricultural Science students, they are required to undergo compulsory SIWES programme for a period of four months to bridge the gap between theory and practice as it exist in the World of Work (Ugwuoke, 2012).The SIWES programme will help to expose the Agricultural Science student on the work skills needed in the areas of Crop productions, livestock production, Agricultural Economics, Agricultural Extension, as well as skills needed for handling agricultural equipment and machines that are necessary for carrying out crop and livestock production.

During the Students Industrial Work Experience Scheme(SIWES), assessment of students' learning outcome in relation to achievement of the objectives of the Students Industrial Work Experience Scheme(SIWES) programme is carried out after field instructions by the coordinators and lecturers in the nature of oral defense which is cognitive based. To this extent, the researcher only observed that the assessment instrument use by the coordinator and lecturer only assesses the students in the cognitive dormain and as such the students do not really possess the needed psychomotor skill for effective functioning in the world of work in agriculture. This was evident as Ralph (2016) noted that the graduate of Agricultural Science employed to work in the farms/ agro-allied industry do not possesses the psychomotor skills required to work effectively in farms and agro allied industry. Thus to achieve these observable psychomotor skill acquisition by students of agricultural science at graduation, there is need to assess their psychomotor skills through well developed and validated psychomotor instrument during their Students Industrial Work Experience Scheme(SIWES).

Psychomotor instrument are instrument used in determining the extent students posseses psychomotor skills in a given course of study. Psychomotor skill test in Williams (2012) is an instrument for determining the extent to which students can demonstrate their practical

competencies of students during their SIWES programme. Psychomotor skills test is a device with process skills items to be responded to by learners. According to Ombugus,& Umaru(2016) It connote the presentation of series of process skills multiple choice items to be answered by students to assess their practical competencies in crop production and animal production. Thus the present study is therefore designed to develop and validate psychomotor skills to assess the extent of the acquisition of agricultural practical skills by students in the Bachelor of Agriculture Programmed during the SIWES programme.

Thus, after been exposed to the SIWES programme, the prospective Agricultural science graduates are expected to have gain adequate psychomotor skills that will enable them become self-employed and be productive in the agro allied industries and farms that will employ them upon graduation(Ebere,Ibe & Ononogbu, 2017). However, Ralph (2016) observed that the graduates of Agricultural Science employed to work in the farms/ agro-allied industry do not possesses the psychomotor skills required to work effectively in farms and agro allied industry.

This has generated concerns as to actual impact of SIWES programme on Agricultural Science Graduates. A follow up question is whether the objectives are been achieved which amongst which one of them is the production of employable graduates with necessary psychomotor skill. It is against this backdrop that the researcher sought to develop and validate an instrument for assessing psychomotor skills of Bachelor of Agriculture Students (B.Agriculture) students during their Students Industrial Work Experience Scheme(SIWES).

The purpose of the study was to develop and validate a psychomotor skill test for assessing students during Students Industrial Work Experience Scheme(SIWES) of students of Bachelor of Agriculture(B.Agriculture) in Micheal Okpara Universities of Agriculture, Umudike. Specifically the study was aimed

i. to developed a valid Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES)

ii. to determine the reliability of the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSDSIWES)

Based on this two research questions were posed for the study which were

1. What is the validity of the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES)\
2. What is the reliability of the Psychomotor Skills Test For Students During Students Industrial Work Experience Scheme(PSTFSIWES)

Methods

Research and Developmen research design was employed for the study, which deals with the process of developing instruments for assessing students' performances. The study was carried out in Abia State in Micheal Okpara University of Agriculture, Umudike. The population for the study was 1,248 undergraduate students of Bachelor of Agriculture students on Student Industrial Work Experience Scheme(SIWES) spread across three Colleges in the 2016/2017 academic session. The sample of the study was 400 which was selected using the proportionate stratified sampling from the three Colleges before the simple random sampling techniques was then employed to sample the students from each of the three colleges to get the required sample size for each College . The instrument for data collection was researcher developed 52 Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES). Three areas of the curriculum where psychomotor skills are predominant were selected. These were animal production, crop production and skills handling agricultural equipment and machines.

The procedure for the development was identification of psychomotor skills in the animal production, crop production and skills handling agricultural equipment and machines, development of a test blue print, writing out of the items, development of a rating scale, validation of the instrument, final selection of the items to be included in the final copy of the instrument, rating of reliability and finally the tryout of the instrument. The development of the instrument was based on the table of specifications and Simpson's taxonomy of psychomotor Domain (Simpson, 1972). The (PSTFSIWES) was administered to 400 students. Data was generated for the determination of construct validity of the (PSTFSIWES) using the Factorial Analysis(Confirmatory Factor Analysis). Reliability of the (PSTFSIWES) was determined during pilot test by use of Cronbach alpha for the internal consistency and Pearson's Product Moment Correlation Coefficient(PPMCC) for the measure of stability of the (PSTFSIWES).

Results and Discussions

Research Question 1. What is the validity of the Psychomotor Skills Test For Students Industrial Work Experience Scheme (PSTFSIWES)?

The validity of the developed instrument used in assessing psychomotor skills test. The analysis included a final administration validity was inducted. This was carried out using the factor analysis. Since the pilot study was carried out using expository factor analysis. Prior to the pilot study, the instrument used in assessing psychomotor skill test had 52 items out of which 31 items survived. Thus, based on the research question above, the validity of the final administration of the 57 items was carried out using Confirmatory Factor Analysis (C. F.A) to yield the following items**.**

TABLE 1

S/NO	Factor 1(Crop Production)	Factor Loading
1.	The students can now identify the different soils for cultivation of different soils	3.89
2.	The students can now prepare beds for farming operations	4.64
3.	The students can now identify crop diseases and crop pest	3.43
4.	The students can carry out the different planting operations of crops	3.53
5.	The student control crop diseases using appropriate chemicals	3.81
6.	The students can identify appropriate fertilizer required by different crops	4.26
7.	The students can mix agrochemicals well	3.71
8.	The students can carry out weeding operations in the farm	3.71
9.	The student can now value ridges, nursery bed and mounds	3.52
10.	**The students now know pesticides to apply to the plant**	4.31

The data on table 1 showed that only 10 items on the factor 1 from 17 items were retained and were pure this is because they reached the criteria recommended by Madu(2012) of at least 0.30 for an item to be regarded as pure.

Table 2

S/NO	Factor 2 (Animal Production)	Factor Loading
11.	Brood chicks	3.76
12.	Feed livestock with right feeds at the right time	3.91
13.	Prepare and disinfect pens adequately	3.31
14.	Deworm farm animal at the right time with the correct dewormer	2.83
15.	Provide adequate ventilation in farm animal pens	3.72
16.	Treat the animal when they fall sick	3.64
17.	Fatten livestock for sale	3.60
18.	Cull animals that are not desirable	3.61
19.	Predict oestrus in farm animals	3.53
20.	Formulate different types of feeds for livestock	3.81
21.	Carryout different management practices	**4.87**

The data on table 2 showed that all 11 items from 19 on factor 2 were retained and were pure this is because they reached the criteria recommended by Madu (2012) of at least 0.30 for an item to be regarded as pure.

Table 3.

S/NO	**Factor 3(skills handling agricultural equipment and machines)**	**Factor Loading**
22.	couple plough to tractor	3.63
23.	drive and work with tractor in the farm	3.46
24.	use knapsack sprayer to spray agrochemicals.	3.83
25.	use milking machine to extract milk from cow	3.89
26.	cultivate the soil with ridger	3.43
27.	harvest crops using harvester	4.02
28.	store agricultural tools well after use.	3.86
29.	maintain the equipment and machines to prevent damage.	3.95
30.	handle incubator for incubating eggs	3.61
31.	work with planters in the farm	**3.67**

The data on table 3 showed that 10 items from 16 on the factor 3 were retained and were pure this is because they reached the criteria recommended by Madu(2012) or at least 0.30 for an item to be regarded as pure.

Research Question Two: What is the reliability of the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES)?

To determine the reliability of the Psychomotor Skills Test for Students during Students Industrial Work Experience Scheme (PSTFSDSIWES), two types of reliability was carried out which were the internal consistency and coefficient of stability. The internal consistencies of the Psychomotor Skills Test for Students Industrial Work Experience Scheme (PSTFSIWES) and its subscales were established using Cronbach's Alpha. The result of the analysis is presented in table 4 and 5.

Table 4: Internal consistencies of the final draft of Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES).

PSTFSDSIWES.	**No of items**	**Cronbach's alpha**
Factor 1	10	0.88
Factor 2	11	0.81
Factor 3	10	0.79
PSTFSIWES.	31	0.83

The data on table 4 revealed that factor 1(crop production) had an internal consistency value of 0.88 using the Cronbach's Alpha, factor 2(animal production) had an internal consistency of 0.81 using the Cronbach alpha while factor 3(skills handling agricultural equipment and machines) had an internal consistency of 0.721 using the Cronbach alpha. Finally, the **PSTFSIWES** had an internal consistency of 0.851. The internal consistencies were regarded as reliable, this is because Maduabum(2004) recommend an internal consistency scores of 0.70 – 0.90 as reliable.

The coefficient of stability of the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES) was determined using the Pearson's Product Moment Correlation Coefficient after a test-retest was conducted.

Table 5: The Pearson's Product Moment Correlation Coefficient of the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES).

	No of items	r	Decision
Factor 1	10	0.84	High positive
Factor 2	11	0.83	High positive
Factor3	10	0.79	High positive
PSTFSDSIWES.	31	0.87	High positive

The data on table 5 do revealed that the factor 1 had a coefficient of stability (r) of 0.84 factor 2 coefficient of stability is 0.83 and factor 3 had a coefficient of stability is 0.87 while the PSTFSIWES had a coefficient of stability (r) of 0.87. Thus the coefficient of stability was established using the Pearson's Product Moment Correlation Coefficient. The coefficient of stability (r) of the factors 1, factors 2, factor 3 and (PSTFSDSIWES) were reliable and since there coefficient of stability (r) were above 0.70. This was the recommendation of Maduabum (2004).

4.3 Discussion of Findings

Validity of the Psychomotor Skills Test For Students Industrial Work Experience Scheme (PSTFSDSIWES)

The analysis of the research question one revealed that the validity the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES) and its subscale was carried using the Confirmatory Factor Analysis (C.F.A). The findings show that 10 out of 17 skill items which indicates that the students can now identify the different soils for cultivation of different soils, prepare beds for farming operations, identify crop diseases and crop pest, carry out the different planting operations of crops, control crop diseases using appropriate chemicals, can identify appropriate fertilizer required by different crops, can mix agrochemicals well, can carry out weeding operations in the farm, can value ridges, nursery bed and mounds and the students now know pesticides to apply to the plant. This items have content validity which were considered suitable for inclusion in the psychomotor skill test used in assessing the student

psychomotor skills in crop production was supported by Kesiki, Amuche& Igomu(2014) in a study on development and standardization of an instrument for assessing practical's among students in colleges of agriculture in Nigeria where it was found out that 30 items of PSAICP were found to be the main basic skills most valued and assessed during CPP practical work. This finding agreed with the findings of Williams (2012) in a study on Factorial Validation of Psycho-productive skill test for assessing senior secondary school students in woodwork in Ondo State, where it was found out that the content validity ratio of the items confirmed the content validity.

The answered research question one also showed the validity the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSDSIWES) in animal production using the Confirmatory Factor Analysis (C.F.A) had 11 items out of 19 were retained since they were factorially pure. The items retained showed students have skills in brooding chicks, feeding livestock with right feeds at the right time, prepare and disinfect pens adequately, deworm farm animal at the right time with the correct dewormer, provide adequate ventilation in farm animal pens, treat the animal when they fall sick, fatten livestock for sale, culling animals that are not desirable**,** predict oestrus in farm animals**,** formulate different types of feeds for livestock and carryout different management practices. This finding is in agreement with Ugbalu (2013) who stated that for a test to meet the content validity criteria, it must identify the subject matter topics, behavior outcome to be measured and be constructed following a table of specification which has been built to specify the sample of items to be measured.

The answered research question one also showed the validity the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES) in skills of handling agricultural equipment and machines animal production using the Confirmatory Factor Analysis (C.F.A) had 10 items out of 16 were retained since they were factorially pure. The item which

were retained assesses students on how to couple plough to tractor, drive and work with tractor in the farm**,** use knapsack sprayer to spray agrochemicals, use milking machine to extract milk from cow**,** cultivate the soil with ridger**,** harvest crops using harvester**,** store agricultural tools well after use maintain the equipment and machines to prevent damage, handle incubator for incubating eggs and work with planters in the farm. Thus this indicates the instrument is valid in content for the assessment of psychomotor skills in skills of handling agricultural equipment and machines animal production. Thus the finding is in agreement with Badmus (2005) that an essential step for developing a valid performance assessment instrument or performance based test involves determining appropriate items for inclusion in the test i.e. the process skill rating scale through task analysis procedure and validation by subject matter experts.

The satisfactory validity of The Psychomotor Skills Test for Students Industrial Work Experience Scheme (PSTFSIWES) was because the test was constructed based on a table of specification which specified the sample of items to be used and was constructed to be closely fitted within the table of specification. This agreed with Ugbalu (2013) who stated that for a test to meet the content validity criteria, it must identify the subject matter topics, behavior outcome to be measured and be constructed following a table of specification which has been built to specify the sample of items to be measured.

Reliability of the Psychomotor Skills Test For Students Industrial Work Experience Scheme (PSTFSIWES)

The findings from analyses of research question two showed that the internal consistency of the Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES) and its sub-sets are highly reliable. These findings are in agreement with the findings of Abubakar (2009) whose instrument for evaluating Administrative skills in technical colleges had

a reliability of 0.96. The finding also agrees with Sakiyo (2009) who developed a Biology achievement test with a reliability of 0.78 and Ibrahim (2012) determined a reliability of 0.87 for an instrument for assessing manipulative skills in bricklaying practices.

The analyses of research question two also revealed that the coefficient of stability of Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES) and its sub scale are reliable, this was because Agbaebgu (2011) revealed that reliability index of 0.50 and above indicates that the instrument is reliable while the coefficient of stability which falls within 0.50 -0.90 are highly reliable which also show that the test has high coefficient of stability. Hence the findings of the present study is in agreement line with the findings of Earp(2007) whose coefficient of stability do revealed that it falls within the acceptable range of 0.50-0.90 which is regarded as highly reliable.

CONCLUSION

Based on the results of this study, Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES) has been found to be valid and reliable which makes it is capable of effectively assessing Bachelor of Agriculture(B.Agric) students' psychomotor skills in Students Industrial Work Experience Scheme in crop production, animal production and skills of handling agricultural equipment and machines.

RECOMMENDATIONS

Based on the findings, the following recommendations were made

1. The universities should integrate the developed and validated Psychomotor Skills Test For Students Industrial Work Experience Scheme(PSTFSIWES) should be used in assessing psychomotor skills of students during Students Industrial Work Experience Scheme(SIWES) for Bachelor of agricultural programmes and all practical programmes.

2. Workshop and seminars should be organized for lecturers on how to use the(PSTFSIWES) for the assessing psychomotor skills of students during Students Industrial Work Experience Scheme(SIWES).

References

Abubakar U. (2009) Development and validation of an instrument for evaluating administrative skills of Science and Technical College Principals in Nigeria. Unpublished Ph.D Thesis ATBU, Bauchi.

Earp, M.S(2007) Development and Validation of the Statistics Anxiety Measure. An unpublished Ph.d Dissertation submitted to graduate school university of Denver

Ebere, C., Ibe, V.S.O. & Ononogbu, N.(2017) Evaluation of student's industrial work experience scheme (SIWES) on the attainment of employable skills by agricultural education graduates in Abia state. *International journal of agricultural and home economics education (IJAHEE) 4(1) 115-127.*

Eze D.M. (2003). *What to write and how to write*: A step guide to educational research proposal and report. Enugu: Pearls and Gold.

Ibrahim, D (2012).Development and validation of an instrument for assessing students manipulative skills in Bricklaying and Block laying practice at Technical college in Niger state ; Nigeria. Unpublished paper presented at industrial & technology education Dept Federal University of Technology. Minna

Industrial Training Fund (2003). *Students industrial work experience scheme in human Resource development in Nigeria*. Jos: Industrial Training Fund.

Joshua, S.D. (2007). Attitudinal disposition of seminar secondary school students towards agriculture in Maiduguri metropolitan Borno State. *Medwell Agricultural journal*. **3**(2): 120 – 124.

Kesiki, K.G., Amuche, W.B & Igomu, C.,(2014) development and standardization of an instrument for assessing practical among students in colleges of agriculture in nigeria *International Journal of Education and Research Vol. 2 No. 6 399-414*

Madu, A.O. (2012). Development and validation of agricultural science survey achievement test for senior secondary schools in Platuea state. Unpublished Doctorate dissertation University of Jos, Jos

Maduabum, M.A. (2004). *Fundamentals of education research.* Owerri: Versatile Printers..

Ombugus, D.A &Umaru, R.I (2016) Psycho productive skills multiple choice test items for assessing students in mechanical engineering craft in technical colleges. *European journal of studies. 2(2) 78-92*

Osinem, E.C. & Nwoji, U.C. (2010). *Students industrial work experience in nigeria: Concepts, principles and practice.* Enugu: Cheston Agency Limited.

Philip, D., Nkonya, E., Render, J. & Oni, A.O. (2008). "*Constraint to increasing agricultural productivity in Nigeria"*: Nigeria strategy support programme brief. No 4 IFPRI (*International food policy research institute*).

Ralph C.E (2016). *Evaluation of student's industrial work experience scheme in Abia State*. An Unpublished B.Sc project submitted to the Department of Agricultural Education, Micheal Okpara University of Agriculture, Umudike.

Sakiyo, J. (2009). Development and standardization of Biology achievement test for SSSstudent in Adamawa state .*Journal of Technology & Development Vol 11 P 78-83.*

Ugbalu, N.M. (2013). Development and validation of metal work process evauation scheme for NCE (Tech) Students. International Institute for Science, Technology and Education. *Journal of Education and Practice 5 (1),* 63-72.

Ugwuoke, C.U(2012). Appraisal of students industrial work experience scheme graduates performance in agricultural education in colleges of education. A published M.Ed theses submitted to the post graduate school, University of Nigeria, Nsukka

Williams, P.S.(2012). Factorial Validation Psycho-productive Skills Test for assessing Senior Sec. School Students in Woodwork in Ondo State. Nigerian Association of Teachers of Technology (NATT) 22nd Annual National Conference Proceedings, 184-188.