

STANDARDIZATION OF SEMANTIC DIFFERENTIAL SCALES FOR MEASUREMENT OF SENIOR SCHOOL STUDENTS' ATTITUDE TO AGRICULTURAL SCIENCE

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ABSTRACT

Involvement of Nigeria's teaming youths in the agricultural transformation process has been a major challenge, especially as most farmers are ageing. The current research fills the gap by standardizing the inventory which Olatunji developed for use in the measurement of students' attitude to agriculture. Through multistage sampling procedure, a sample of 1064 male and female Senior School One (SS1) Students were selected from the population of 51,300 from Abia, Ebonyi and Imo States of Nigeria. The validated semantic differential scales for measurement of Senior School Students' attitude to agricultural science which was developed by Olatunji in 2014 was administered to the study sample. Data were analyzed with the aid of descriptive statistics such as percentage, means, standard deviation and z- scores. The results of data analyses showed that Group and Sex norms were established and guidelines for effective utilization of the inventory were provided. The inventory should be especially useful to Guidance Counsellors, Agricultural Science Educators, Curriculum Planners Researchers and anyone else who may be interested in taking objective classification, selection and placement decisions about students (in-school-youths).

Key words: Agriculture, attitude, measurement, inventory, semantic differentials, youths, students

INTRODUCTION

The problem of agricultural and rural development in Nigeria appears to have become endemic and its amelioration requires holistic approach. Most Nigerian farmers are ageing and youths which constitute over 45% of the population appears to be negatively disposed to agriculture (Nwachukwu, 2008; Olatunji, 2014). One way the teaming youths can be mobilized for effective participation in agriculture is to constantly monitor and modify the attitudes of in-school-youths (students) to agriculture. Validated and standardized inventories are needed for investigating students' attitude to agriculture as a basis for providing intervention programmes for ameliorating their unfavourable disposition and involving them in the agricultural transformation process.

The National Policy on Education stipulates that the 6-3-3-4 system of education would adopt Continuous

Assessment of all areas of students' development. Continuous Assessment (CA) was also a key element in evaluation of students' cognitive, psychomotor and affective domains under the current 9-3-4 system of education being implemented in Nigeria (FGN, 2004). The utility if CA has not been in doubt but teachers are not provided sufficient guidelines required for reliably assessing the psychomotor and affective domain outcomes. A teacher may become adept at subjectively estimating the capabilities of students and be able to make wise decisions about them. Unfortunately, others teachers may not possess the same subjective skills and, as such, not able to evaluate students with some accuracy. This underscores the need for valid and reliable instruments so that all teaches could obtain essentially the same estimates of changes that are taking place in students' psychomotor and affective domain outcomes (Nkpa, 1992; Olatunji and Etuk, 2010). It was against this background that Olatunji (2014) developed and validated a scale for measurement of Senior School

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Students' attitude to agricultural science. The study employed Osgood's semantic differential scaling technique (Osgood, 1957) because of its comparative advantage over other scaling techniques. For example, the semantic differential scales are versatile, easy to use, able to reveal traits which respondents may not be able to articulate, and is less prone to misunderstanding by respondents because the statements in other techniques are not devoid of ambiguity. (Nkpa, 1992, Himmelfarb, 1993). Heise (2010) had explained that the semantic different can be used to describe, not only persons, but also the connotative meaning of abstract concepts.

Olatunji, (2014) used a sample of 540 Senior School One (SS1) students from 12 out of 24 Senior Secondary Schools in Umuahia North and South Local Government Areas of Abia State for the study. The researchers followed the guidelines for developing valid and reliable instruments for measurement of affective domain outcomes as stipulated by Gardner (1975), Gronlund (1976) and Onacha and Okpala (1995). They assembled 13 sub-scales and a pool of initial 180 bipolar adjectives. Cronbach Coefficient Alpha and Factor Analyses were employed to analyze data. Factor analysis enabled the researcher to assess the factorial validity of the sub-scales and items that made up the scales by telling the extent to which they seemed to be measuring the same concept or variable. Thus, the use of Factor analysis helped to reduce the number of sub-scales to 12 and the bipolar adjectives to 35 from the initial 180. The reliability for each sub-scale ranged from .75 to .93. The Cronbach Coefficient Alpha for the entire scale is .81. Thus, The results of data analyses indicated that twelve (12) sub-scales and 35 bipolar adjectives were the most valid and reliable for measurement of Senior School Students attitude to agricultural science (Appendix 1).

The general dearth of valid, reliable and standardized instruments for assessment of the affective domain outcomes have been established in literature (Enenugo 1992; Olatunji, 1998, Olatunji and Etuk, 2010 and Onofeghara and Olatunji, 2009). The available instruments are not necessarily maximally effective measures of attitude to agricultural science. Since human development is predicated on agricultural development, it is pertinent to constantly monitor students' attitude to agricultural science with a view to providing intervention programmes that would enhance positive disposition to agriculture among Nigerian youths. Continuous use of validated and standardized attitude to agricultural science inventories would provide data

needed for monitoring changes that are taking place in learners' disposition to the subject and provide a basis for selecting activities that would improve learners' attitude to, enrolment and achievement in, and uptake of agriculture as a career or vocation.

It is against this background that it became imperative to standardize this validated and reliable "Olatunji's Semantic Differential Scales for Measurement of Attitude to Agricultural Science" (Olatunji, 2014). The concern here is to make the instrument useable for generating normative data (class, age, percentile and standard score forms) (Onocha and Okpala, 1995). While comparing teacher-made test to standardized test instruments, Gronlund (1976) had explained that :

1. standardized inventories measure outcomes and contents that are common to majority of the population under study.
2. the qualities of items in standardized inventories are usually high.
3. reliability coefficient is usually high (Commonly between .80 to .95.)
4. scores can be compared to norm groups.
5. procedures for administration are usually standardized with specific instructions provided and
6. test manual and other guides that aids interpretation and use are provided.

Thus, the general objective of this study was to standardize "Olatunji's Semantic Differential Scales for Measurement of Attitude to Agricultural Science" (Olatunji, 2014). More specifically, the study:

1. established the class or group norm
2. established the sex or gender norm
3. provided general guidelines for utilization of the standardized inventory

METHODOLOGY

The population of study comprised all the 51,300 Senior School One (SS1) students in the 5 South Eastern States of Nigeria (Abia, Anambra, Ebonyi, Enugu and Imo States). Multistage sampling procedure was employed to select a sample. First, 3 out of 5 States were selected through simple random sampling. Then, 43 out 1140 Senior Schools were selected through stratified random sampling. Finally, 30 students were selected from each of the 43 schools se. In all, the sample comprised 1064

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male and female SS1 students. The validated semantic differential scale for measurement of Senior School Students' attitude to agricultural science which was developed by Olatunji (2014) was administered to the study sample. Data were analyzed with the aid of descriptive statistics such as percentage, means, median, standard deviation and z- scores.

Establishment of class or group norm

The scores of the 1064 respondents on the semantic different attitude to agricultural science scales were analyzed. The findings were as shown in Table 1. The mean score of the 1064 standardization sample for the inventory is 188.1. The males were 31.6% while females are 68.4%. The median score is 178. Mode is 180, while standard deviation is 26.3.

RESULTS AND DISCUSSION

The results of data analyses were presented in frequency distribution tables and discussed in the following paragraphs.

Table 1: Descriptive statistics of the Normative Group: Class Norm

Statistic	Sample size (N)	Gender sample Female	of Males	Sun of Score	Mean s	Media n	Mod e	standar d deviatio n
	1064	336	728	200113	188.1	178	180	26.3
Percent	100	31.6	68.4					

Establishment of the sex or gender norm

The results of data analysis for establishment of gender norm was as shown in Table 2. The gender normative data revealed a mean score of 189.8, Median 179.5, Mode 178 and standard deviation of 23.8 for Males. The females normative data were: Mean = 187.3, Median=177 and Mode =193 while the standard deviation is 27.3.

Table 2: Descriptive statistics of the Normative Group: Gender Norm

Statistics	Samples size (N)	Sum of Scores	Means	Median	Mode	standard deviation
Males	336	63768	189.8	179.5	178	23.8
Females	728	136345	187.3	177	193	27.3
Total	1064	200113				

Guidelines for effective utilization of the Attitude to Agricultural Science Scales

The results of data analysis presented in Tables 1 and 2 showed that a valid, reliable and standardized inventory for measurement of Senior School Students' Attitude to Agricultural Science has been developed. The instrument consists of 12 subscales and 35 items in all. The

instrument is presented in Appendix 1. Production of guidelines for utilization is an important aspect of the process of developing standardized inventories. The guidelines for utilizing standardized Olatunji's semantic differential attitude to agricultural science inventory were presented in the following paragraphs.

1. Target audience

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It is recommended that the instrument be used among Senior School One Students (Age range 15-17 years) in Nigeria, especially as a preparation for guidance and career counseling of students on the subjects to choose or enroll in the Senior School Certificate Examination.

2. Test procedure

The administrator of the test should prepare respondents' mind by informing them that it is not a "pass-fail" For example:

Mathematics is:

*		VVE	VE	E	NE ND	D	VD	VVD	
This	Easy		*						Difficult

means that I find Mathematics Very Easy.

Note : VVE = very very easy (7points), VE = very easy (6points). E = Easy (5points), NE/ND = Not so easy, nor so difficult (4 points), D = difficult (3 points), VD = very difficult (2points) and very, very difficult (1point).

3. Testing Time

Although, time is not a factor, a typical Testee completes the inventory in about 15 minutes

4. Scoring

The seven (7) blanks between each pair of bipolar adjectives are weighed 7, 6, 5, 4, 3, 2, and 1 from positive through the negative adjectives at both ends of each scale continuum. The highest and least score obtainable by a respondent are 245 and 35 respectively. A respondent's raw score would be the sum total of his score on all the 35 items in the 12 scales. The test yields one score on the 12 subscales and 35 items.

5. Interpretation of scores

examination. Rather, it is a tool to guide them in selecting subjects that would be beneficial to them. He or she should explain to the respondents to place asterisk in the continuum between pairs of adjectives in the left and right columns to represent the degree of his or her feelings about Agricultural Science in the attitude dimensions.

i. Criterion-reference interpretation. Since there are 35 items in the inventory, a respondent who ticks only and all blanks on the column closet to the negative adjectives at the extreme right of the scale continuum would have a total scale score of 35. The other respondent who ticks only the extreme left columns will have a scale score of 245. Thus, the maximum score obtained by a respondent could be read off the table (Table.3) and his attitude to Agricultural Science described. The raw score obtained by a respondent may be interpreted thus, a student whose raw score on the instrument lies between 1-35 may be regarded as exhibiting very highly unfavourable attitude to Agriculture while the other whose raw score ranged from 211 to 245 would be classified as exhibiting very highly favorable attitude to Agricultural science as indicated in

Table 3: Criterion-reference interpretation of scores on the "Attitude to Agricultural Science Scales

Score range	211-245	176-210	141-175	106-140	71-105	36-70	1-35
Category	7	6	5	4	3	2	1
Attitude description	Very favourable attitude	High favourable attitude	Favourable attitude	Average	unfavourable attitude	High unfavourable attitude	Very high unfavourable attitude

ii. Norm-Reference Interpretation

A respondent’s score may be interpreted in relation to the scores of the normative group (Class Norm or Gender Norm) as described below:

1. Class Norm: A researcher, Teacher or Guidance Counsellor who wishes to interpret respondents’ scores in relation to their Class or Group norm should proceed thus:

i. Convert scores to derived z- Scores using the formula

$$Z = \frac{X - \bar{X}}{SD} = \frac{RawScore - Mean}{StandardDeviation}$$

ii. Compare the results in (i) above with the scores in Table 4 and interpret.

The user of the instrument would subtract the mean score for the entire group of respondents in his study from the raw score of a particular subject. The product will be divided by the standard deviation score for the group. Let us assume that the z-score is 0.25 then go to step ii. In the example provided above, the z score is 0.25. Compared to the normative group, the individual would belong to the “Favourable Attitude” group because his z-score is similar to that of his normative group who were classified as having favourable attitude to agricultural science.

Table 4. Table of Norm-reference interpretation of Z-scores on “Attitude to Agricultural Science Scale

Categories	1	2	3	4
Z-Score	-5.82 - -1.1	-0.04 – -1.07	0.00 - +0.34	+0.36 and above
Attitude description	Highly Unfavourable Attitude	Unfavourable Attitude	Favourable Attitude	Highly Favourable Attitude

2. Gender Norm

Users of the scale who wish to interpret the results on gender lines would proceed as indicated under Class Norm. However, comparison of respondents’ score would be done in Table 5. A respondent who’s Attitude to Agricultural Science score belong to either category 3 or 4 would be seen as having attitudinal disposition that will likely predispose him to enrollment in, choice of or successful achievement in the agricultural science. Thus,

he or she would be encouraged to choose Agricultural Science among other subjects for his Senior Secondary School Certificate Examinations. Those who belong to category 2 may be encouraged to develop a more positive attitude to the subject. Intervention programmes, such as Exhibition, Agricultural Shows, giving of awards and prizes to best students in agricultural science may be implemented in order that those whose attitude are at low ebbs may be motivated to develop a more positive attitude to the subject.

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Table 5: Table of gender-related norm-reference interpretation of Z-scores on "Attitude to Agricultural Science Scale"

Gender	Categories	1	2	3	4
Male	z-Score	≤ -1.13	-1.1--0.5	.0-0.18	≥0.22
Female	z-Score	≤ -1.11	-1.07- -0.05	0 -0.28	≥ 0.32
Attitude description		Highly Unfavourable Attitude	Unfavourable Attitude	Favourable Attitude	Highly Favourable Attitude

SUMMARY AND CONCLUSION

"Olatunji's Semantic Differential Scales for Measurement of Students' Attitude to Agricultural Science" has been standardized. The class norm and gender/sex norm has been provided. A comprehensive guidelines has been provided for its administration, scoring, interpretation of scores and purposes that the instrument may serve has been described. The inventory has utility for effectively guiding students in the choice of agriculture as a school subject and selection of higher studies in and up take of career in agriculture.

RECOMMENDATIONS

Based on the results of this study, it is recommended:

1. that Agricultural Science Teachers, Career Counsellors, Science Educators and other stakeholders effectively utilize this instrument for monitoring students' attitude to agricultural science. This will provide a basis for effectively guiding students towards appropriate vocational and career choices. It will also provide a basis for identifying and implementing relevant intervention programmes that will improve students' attitude to and participation in Agriculture. The results of utilization of the scale can be used to predict with precision, students who will most likely pursue higher studies in or choose a vocation or career in Agricultural Science.
2. that Guidance Counsellors should administer this scale on all Senior School One (SS1) Students prior to the period they select subjects for study in Senior Secondary School. The results of data analyses should be used to guide students who exhibit positive attitude

towards agriculture to select agriculture while those who exhibit negative attitude to Agricultural Science may be counselled to take other subjects for which they have developed more positive attitude, since attitude have been found to correlate positively with achievement.

3. that the results of utilization of this instrument be used for effective planning and efficient management of scarce human and material resources in the education sub-sector of the economy. Educational planners and other stakeholders can use the results of utilization of the inventory to effectively plan and efficiently manage agriculture-related school resources (number of teachers, classrooms, school farm, etc) in the Senior Secondary and in Tertiary Institutions.

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APPENDIX 1

"Olatunji's Semantic Differential Scales for Measurement of Attitude to Agricultural Science"

This is an Attitude to Agricultural Science inventory. The instrument is meant to assist you discover your disposition towards Agricultural Science. There are no correct or incorrect responses.

Section A: Respondent's demographic information

Instruction: Please, provide information required hereunder:

- (1) NameSex (Male or Female).....Age.....
(2) Students' bias (Science or Arts) (Discipline preferred in School Certificate.....
(3) School.....Class.....
(4) StateCountry.....Tribe.....
(5) Preferred Course in Higher Institution.....

Section B - Instructions

Please, place asterisk in the continuum between pair of adjectives in the left and right columns to represent the degree of your feeling toward Agricultural Science in the following attitude dimensions.

Consider the following example:

Mathematics is:

Table with 9 columns: *, VVE, VE, E, NE/ND, D, VD, VVD, and Difficult. Row 1: This, Easy, ||, |*, ||, ||, ||, ||, ||, Difficult

means that I find Mathematics Very Easy.

Note: VVE = very very easy (7points), VE = very easy (6points). E = Easy (5points), NE/ND = Not so easy, nor so difficult (4 points), D = difficult (3 points), VD = very difficult (2points) and very, very difficult (1point).

Section C: The Attitude to Agricultural Science Scales

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1 .Agricultural Science Lessons are:

1	exciting							Dull
2	valuable							Worthless
3	varied							monotonous
4	refreshing							Wearisome
5	attractive							Unattractive

2. Agricultural Science Laboratory Activities are:

6	enjoyable							un-enjoyable
7	masculine							Feminine
8	valuable							Worthless
9	fascinating							un-fascinating

3. Agricultural Shows or Exhibitions are:

10	enjoyable							un-enjoyable
11	valuable							Worthless
12	informative							uninformative
13	simple							Complex

4. Doing Agricultural Field or Farm Practical is:

14	satisfying							Unsatisfying
15	fascinating							un-fascinating
16	enjoyable							un-enjoyable

5. Writing Tests, Assignments and Examinations in Agricultural Science is:

17	satisfying							Unsatisfying
18	enjoyable							un-enjoyable
19	varied							Monotonous

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6. Participation in Young Farmers’ Clubs’ Activities is:

20	refreshing								Wearisome
21	enjoyable								un-enjoyable
22	valuable								Worthless

7 Listening to Extension Agents’ talks about Agricultural Production Recommendations is:

23	exciting								Dull
24	refreshing								Wearisome
25	straightforward								complicated

8. Reading Agricultural Science textbooks is:

26	informative								Uninformative
27	attractive								un-attractive

9. Watching Agricultural Science Programmes on Television, in Films, Video tapes or in the Internet is:

28	enjoyable								un-enjoyable
29	relevant								Irrelevant

10. Reading Pamphlets, Magazines or Posters on Agriculture is:

30	fascinating								un-fascinating
31	varied								Monotonous

11. Pursuit of Higher Studies in Agricultural Science is:

32	exciting								Dull
33	satisfying								Unsatisfying

12. Choosing Agricultural Science as a Career is:

34	interesting								un-interesting
35	exciting								Dull