Construction and Validation of Biology Guttman Attitude Scale Using Exfloratory Factor Analysis

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ABSTRACT
The study was aimed to constract and develops Biology Guttman scale, an instrument to be used to measure students attitudes toward Biology in Senior Secondary Schools in Ogba, Egbema Ndoni Local Government Area of Rivers State. The Biology attitude scales (BAS) was developed by applying the psychometric approach. The Guttman Biology attitude scale comprises of fifty items which was administered to 360 students in Rivers State. The respondents were students ranging from senior secondary one class (SS1) to senior secondary three classes (SS3). The reliability coefficient was 0.897. factors analysis with the use of direct oblimin rotation was employed and it yielded six factors which include lack of enthusiasin towards Biology; positive disposition towards Biology, Phobia for Biology, teacher factor to study Biology, belief about Biology as a subject and un willingness to make effort. The instruments were determined to be good. Based on the observed findings, the Guttman attitude scale for Biology can be recommended for use in the investigation of student's attitude toward Biology in secondary schools.

INTRODUCTION

Guttman scales are members of a family of models known as deterministic models, where it is assumed that the item characteristic curves are without error. Suppose that we have a 20 item Guttman scale, with the items in order of difficulty. Then, if a subject gets item 9 correct, he is bound to get items 1-8 correct. If he fails on item 10, items 11-20 will also be failed. Such ordering will be true for all subjects on a Guttman scale.

In terms of item characteristics curves, Guttman model assumes that up to a point on the latent trait or attribute, the probability of response alpha is 0 and beyond this point it is 1 (Moore, 2000). This implies that each item has a biserial correlation with the total scale score of 1 and that it discriminates perfectly at some point on the latent trait continuum.

The aim of the construction of Guttman Biology attitudes scales is to select items with a level of difficulty such that to fail an item means that all easier items will be passed and harder items failed. According to Newmark (1985), it is a massive sorting task, where large numbers of items and subjects are used and this latter is essential if Guttman scaling is to hold up on further administration of the items. But fortunately, computer programs are now available for scaling items, a task for which, previously, there were a number of tedious algorithms, known collectively as scalogram analysis. Attitude concerns the tendency on the part of students to react favourably or unfavourably towards particular individuals, customs, ideas, or establishment, (Iweka, 2015). The following are some of the ways of assessing attitudes; rating scales,

interview, inventories and observation. The most straight forward way of finding out about someone's attitude would be to ask a few questions from them. Though attitudes are relative to self image and social acceptance (that is, attitude functions) in order to preserve a positive self-image, people's responses may be affected by social acceptance. The most prominent and widespread method for the assessment of attitude has been attitude scale. The attitudes of students to Biology refer to their disposition towards Biology. The attitudes of students in relation to Biology could be determined largely by their opinions and beliefs about it and in this case, Guttman Biology attitude scales would be used. Lawal, (1988) claims that attitude to learning could either be positive or negative. He relates positive attitude to high achievement and negative attitude to low achievement. Osinubi (2004) sees attitude as an affective construct that can be described as a feeling towards an object.

Biology is a popular science subject at the senior secondary school level, as it is offered by most science and social science students. Hays (1973) states that almost all students who registered for the senior school certificate examination registered for Biology with the claim that it is an interesting and compulsory subject. Biology, deals with the study of living things.

According to Bolaji (2005), many teachers tend to overlook the affective domain in their teaching to the detriment of the learners. Similarly, Adebule (2004) explained that various factors affecting the teaching and learning in Nigeria especially at the secondary school level include political, Biology and academic problems. He stressed further that the academic problems include student's unparallel hatred, indifference and poor attitude toward subject being taught. Other scholars also identified some of the factors influencing Biology performance.

The objective of teaching Biology in secondary schools, is to inculcate in secondary school students a culture of Biology literacy which will enable them to apply its theoretical knowledge to real life situations. However the performance of students at the Senior School Certificate Examination (SSCE) shows that the school system has not been able to achieve these objectives (Olaoye, 2005).

Babalola (2009) asserts that the challenges facing the Nigerian education sector in this millennium create avenues to find lasting ways of improving the school system, the curriculum and methods of teaching. Olaoye (2005) observes that student's performance in the examinations conducted by public examining bodies in recent years, which has been attributed mainly to ineffective teaching and learning process in our schools, has become subject of concern both to local and international stakeholders. Despite the concern of stakeholders on students' low level of performance in Biology at the SSCE, many students still take Biology. This is because it is the gateway to Biological Sciences, such as Medicine and Surgery, Pharmacy, Microbiology, Zoology, Botany, etc. Forsythe (2002) claims that many students of Biology, including those specializing in the subject at single or combined honours level, experience difficulty with the method of Biology, particularly in relating abstract concepts, diagrams and models to real-world economic issues and problems'. He added that the method of delivery or teaching is the main reason for this 'difficulty.'

Attitude plays an important role in the learning of any school subject including Biology. This is so because it touches the cognitive, affective and behavioural tendencies of the learner. The way

an individual thinks, perceives, feels, values and acts toward Biology will definitely influence his or her achievement. However, Fakeye (2010), noted that students' failure in mathematics is not only attributable to their negative attitude towards the subject but is also related to the poor attitude of some mathematics' teachers to work and their enthusiasm as they teach the subject. He further noted that there is a strong relationship between attitude and achievement in mathematics. Yara (2009) also noted that the attitude of students can also be influenced by the attitude of the teacher and his method of teaching Studies carried out by House and Telese (2008), Leonard and Evans (2007) have shown that the teachers' method of teaching mathematics as well as his personality greatly account for the students' attitude towards mathematics. He further stated that without interest and personal effort in learning, students can hardly perform 'well in the subject.

Research methodology

Research design

The study is an instrumentation study aimed at validating Guttman Biology attitude scale for secondary school student using factor analysis. A simple survey was used to collect statement of student's attitude towards Biology.

Population

The target population for this study comprises of Senior Secondary Two and three in both public and private schools of Rivers State.

Sample and Sampling procedure

Multi-stage sampling as employed. First, Ogba/Egbema/Ndoni Local Government Area of Rivers State was cluster into urban and rural areas. Purposive sampling was employed to select three (3) private schools and three (4) public schools from the urban area, and four (3) private school and three (3) public schools from the rural areas. The total schools used for this study was 12 secondary schools in Ogba/Egbema/Ndoni Local Government Area in Rivers State. Intact class was used. The sample of the study comprises of three hundred and forty four (344) students.

Procedure for data analysis

The data analysis was in two (2) phase's viz.:

1. Preliminary analysis to check out the fitness of the data for factor analysis. This is to ensure undimensionality. The items should first be factored and only items loading on the first common factor should be selected. Without this preliminary analysis, the lack of dimensionality in Guttman scaling is a serious defect.

2. The factor analysis

The main analysis

- The method of factor extraction as principal component analysis
- There was a check for eigenvalues, communality, and component matrix and scree plot.
- The axis was rotated using oblique rotation (it yielded 6 factors each)
- The test items that loaded on each factor were identified. Only test items with factor loading exceeding .4 were retained for each factor.
- The factors were named

- Item total correlation matrix of the items in each of the sub-scale of the final scale was done to determine the new communality mean and the reliability coefficient of the sub scale it deleted
- Inter—factor correlation was also done to find out if they correlate (i.e the correlation coefficient should be moderate)
- Finally the internal consistency reliability coefficient of the final Guttman attitude scale was determined.

Result and Discussion

This chapter presents the analysis of the data collected for this study. Exploratory factor analysis was used to analyze the data; this method of analysis explores and summarizes underlying correlation structure for a data set.

PRELIMINARY ANALYSIS

1. Sample size adequacy

Research Question One

Is the sample size adequate to provide a stable factor solution?

Kaiser- Meye-Olkin (KMO) measure of sampling adequacy was used to check this out.

The result show that Kaiser-Meyer-Olkin Measure of sampling Adequacy = 0.897 (KMO >.5). This indicates that the patterns of correlations are relatively compactable and so factor analysis should yield distinct and reliable factors.

Research question two

Is the r-matrix an identity matrix?

Table 1
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of sampling adequacy		.897
Bartlett's Test of Sphericity	Approx. Chi-Square	4120.261
	Df	406
	Sig.	.00

Table 4.1 shows the significant level of r-matrix. Bart1etts test of sphencity is highly significant ($p<0.001$) which implies that r-matrix is not an identity matrix; therefore, there are some relationships among the variables in this scale.

2. Data screening: Research question three

Are there redundant, irrelevant and unclear variables in the scale?

Inter item correlation matrix was done to check the determinant of R-matrix before data screening, the result of the analysis shows that the determinant is $1.18 * 10^{-10}$ which is an indication that there are cases of multicolinearity or sphericity in the data, therefore one of each pair of items indicate multicollinearity or singularity were removed since this will make it difficult to assess the contribution of each such highly correlated variables to the factor. Also

item-total correlation was also done to remove items that did not correlate fairly well with the other items in the data. Table 2 shows the first 29 items that were extracted.

Research question four

Do the test items show convergent validity?

To Test this research question, it was subjected to items-total correlation analysis. The result is shown in table 2

Table 2

Validity index of the items of Biology attitude scale

Items		Items		Items		Items		Items	
1	0.397	7	0.374	13	0.544	19	0.520	25	0.397
2	0.415	8	0.468	14	0.494	20	0.613	26	0.423
3	0.459	9	0.517	15	0.546	21	0.529	27	0.559
4	0.474	10	0.397	16	0.628	22	0.500	28	0.541
5	0.384	11	0.364	7	0.440	23	0.459	29	0.581
6	0.380	12	0.540	18	0.564	24	0.468		

**correlation is significant at 0.001 level (2-tailed)

A look at table 2 above showed that the item validity coefficient vary from 0.374 to 0.628 (□= 0.001). The value clearly indicates that the items of the scale were meaningfully related and contributed to the construct being measured. Hence the Guttman Biology attitude scale has significant validity coefficient.

Research question five

What are principal components (factors) of attitude toward Biology?

Factor anal sis extraction was done to show the components of Biology Guttman attitude scale. Table 4.3 lists the eigen values associated with each linear component factor before extraction, after extraction and after rotation.

Table 3: Principle Components of Biology Guttman attitude scale

component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	8.976	30.951	30.951	8.976	30.951	30.951	7.185
2	2.575	8.881	39.832	2.575	8.881	39.832	4.834
3	1.547	5.335	45.167	1.547	5.335	45.167	4.116
4	1.484	5.118	50.285	1.484	5.118	50.285	4.439
5	1.207	4.162	54.447	1.207	4.162	54.447	3.112
6	1.002	3.457	57.904	1.002	3.437	57.904	1.045
7	.916	3.159	61.063				
8	.883	3.044	64.107				
9	.855	2.948	67.055				
10	.782	2.695	69.750				

11	.769	2.653	72.403				
12	.721	2.486	74.889				
13	.680	2.346	77.235				
14	.645	2.223	79.458				
15	.605	2.087	81.545				
16	.572	1.972	83.516				
17	.519	1.789	85.306				
18	.501	1.729	87.035				
19	.470	1.621	88.656				
20	.423	1.458	90.114				
21	.415	1.432	91.545				
22	.404	1.392	92.937				
23	.358	1.234	94.171				
24	.357	1.230	95.401				
25	.320	1.105	96.506				
26	.305	1.051	97.557				
27	.283	.975	98.532				
28	.235	.810	99.342				
29	.191	.658	100.00				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Before extraction, 29 linear components within the data set were identified. The most important twenty nine factors are shown on table 3, these are six (6) factors with eigenvalue above 1.0. They are factors that should be retained. Before rotation, factor 1 explains 30.951% of total variance, factor 2 explains 8.881% of total variance, factor 3 explains 5.335% of total variance up to factor 6 which explains 3.457 of the total variance. After rotation, the total variance cannot be displayed because when component are correlated, sum of squared loadings cannot be added to obtain a total variance.

Table 4.4 shows the table of communalities before and after extraction. The table shows that the communalities before extraction are all 1. The communalities in the column labeled Extraction arc the common variance in the data structure. That is, the proportion of variance that each item has in common with other items in the data.

Research question six

What Proportion of the common variance in the Biology Guttman attitude scale is accounted for by each of the identified underling factor?

Table 4 shows the communalities of Biology Guttman attitude scale before and after extraction.

Table 4: Communalities of Biology Guttman Attitude Scale

Communalities

Items	Initial	Extraction
2	1.000	.543
6	1.000	.561

7	1.000	.591
9	1.000	.597
10	1.000	.609
11	1.000	.622
12	1.000	.563
13	1.000	.663
14	1.000	.672
15	1.000	.617
22	1.000	.387
24	1.000	.646
25	1.000	.630
26	1.000	.515
27	1.000	.676
28	1.000	.671
29	1.000	.484
33	1.000	.516
34	1.000	.571
35	1.000	.609
36	1.000	.538
37	1.000	.433
39	1.000	.511
41	1.000	.516
43	1.000	.646
46	1.000	.653
47	1.000	.559
48	1.000	.574
50	1.000	.619

Extraction Method: Principal Component Analysis

Table 4 shows the table of communalities before and after extraction. Principal component analysis works on the initial assumption that all variance is common: therefore, before extraction the communalities are all the communalities in the column labeled extraction reflect the common variance in the data structure. The communalities after extinction arc the amount of variance in each variable that can be explained by the retained factor. See in table 4, table Shows the factor loading of Biology Guttman attitude scale before rotation.

Table 5: Loading of Biology attitude scale before rotation

	Component					
Items	1	2	3	4	5	6
28	.754					
35	.736					
25	.695					
24	.695					
27	.693					
33	.662					

34	.652					
36	.633					
50	.620					
47	.616					
37	.609					
15	.607					
26	.607					
48	.602					
14	.569					
29	.529					
41	.527					
22	.423					
10		.671				
11		.650				
6		.579				
12		.532				
9	.471	.495				
7	.458	.487				
43	.414		.423			
13	.432			.514		
39				.455		
46	.463		.460		.466	
2						.483

Extraction Method Principal Component Analysis.
a. 5 components extracted.

The table 5 shows the component matrix before rotation. This matrix contains the loadings of each variable onto each factor. Almost all the variables loaded on factor 1 (variable with loading less than 0.4 were discarded). So it was rotated to get a better picture of the actor loading. Oblique rotation was used.

Screen plot was also used as one of the criterion for factors selection

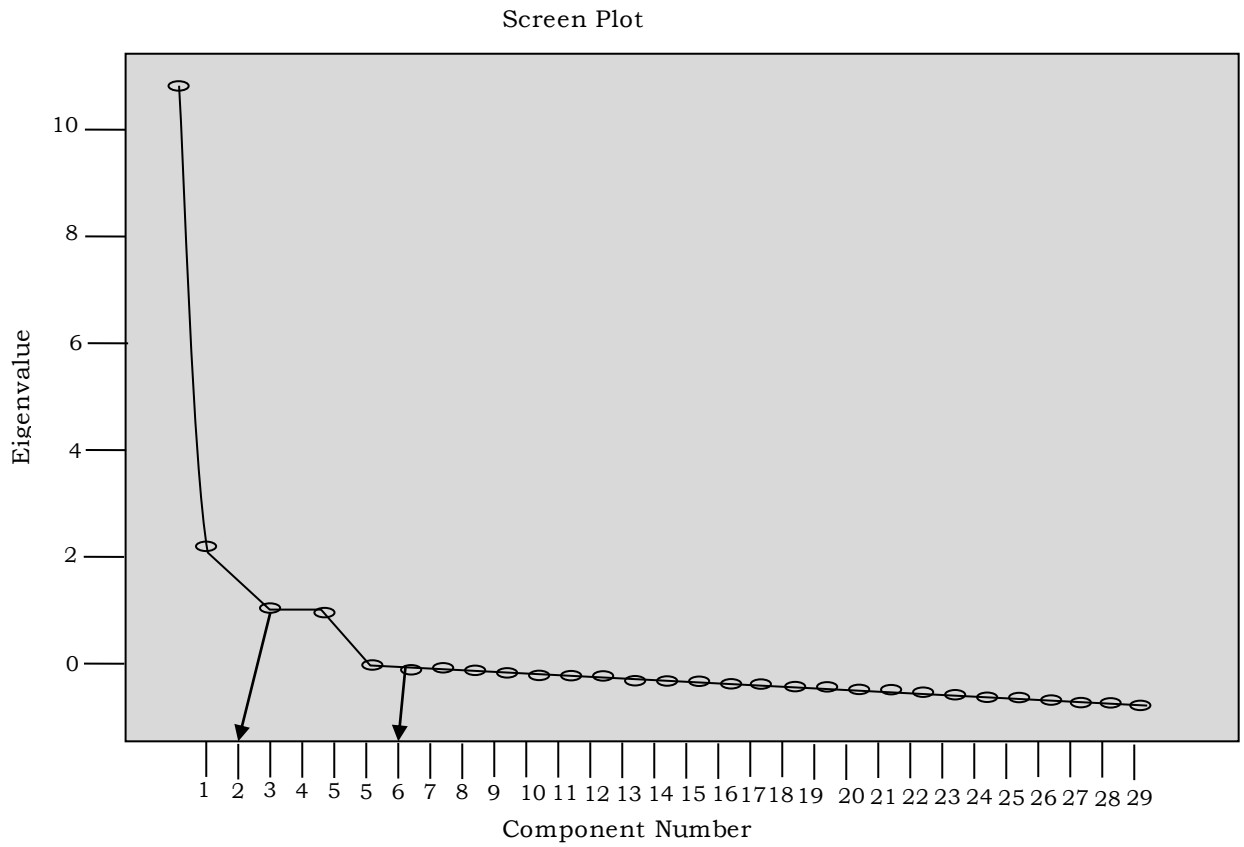

Figure 3. Screen plot

The curve begins to tail in almost in a liner manner after six factors. From the output of screen plots Kaiser's criterion were assumed, then all factors with Eigen values above 1 were retained.

Research question eight.

What are the factors loading for each principal component after rotation?

Table 6: Factor loadings of Biology Guttman attitude scale after rotation

Items	Component					
	1	2	3	4	5	6
24	.799					
27	.735					
28	.731					
34	.716					
25	.675					
26	.651					
35	.619					
33	.521					
29	.437					-415
37	.423					
11		.741				

10		.737				
12		.676				
9		.653				
7		.629				
6		.626				
39			.656			
50			.613			
48			.588			
47			.576			
41			.439			
13				.836		
14				.719		
15				.665		
22				.523		
36						
43					.753	
46					.750	
2						.550

Extraction Method: Principal Component Analysis
Method: Oblimin with Kaiser Normalization

a. Rotation converged in 13 iterations

Table 6 shows the rotated component matrix (rotated factor matrix) which is a matrix of the factor loadings for each variable onto each factor. There are several things to consider about the format of this matrix. First, factor loading less than 0.4 have not been displayed. Before rotation, most variables loaded highly onto the first factor and the remaining factors didn't really get much loading.

Six factors emerged after the Oblimin rotation. The pattern Matrix shows the factor loading on table 4.6. Items that did not load on any of the factor were discarded, the structure matrix which means that the factors are not independent of their own (they are correlated).
29 Guttman attitude statements were identified after oblimin rotation. Thus the final scale has twenty nine (29) items. The factor retained the name adopted from the original scale along with the test items that loaded on each factor.

Group name and description of factor
Factor 1: Lack of enthusiasm towards Biology

1. I feel like copying somebody's work during Biology examination or test.
2. I feel so happy when my Biology teacher does not come to class.
3. I feel like dancing when my Biology teacher does not come to the class
4. I do not do my Biology assignment, if I find it difficult.
5. 1 feel like setting at the back so as to copy from my notebook during Biology examination or test
6. When an Biology examination or test is approaching, I wish strongly that it will be cancelled
7. I copy from my friend when we are given Biology assignment.

8. When I am given a difficult Biology assignment I copy the solution from my friends.
9. I look Ions and to my Biology teacher leaving the class during Biology lesson
10. I do my Biology assignment, but I do not submit them to my teacher w hen am supposed to.

Factor 2: Positive disposition towards Biology

1. I feel very happy just before Biology examination or test.
2. I feel very happy during Biology lesson.
3. I want my Biology teacher to come for Biology class always.
4. I feel that I will pass when expecting my Biology examination result
5. I feel like listening to my Biology teacher during Biology lesson
6. When I am expecting my Biology result I expect a high mark

Factor 3: Phobia for Biology

1. I don't ask question when I don't understand something in Biology lesson
2. I don't like solving calculations in Biology problems
3. I will not do my Biology assignment
4. I feel like sleeping during Biology lesson
5. I copy during Biology examination

Factor 4: Teacher factor to study Biology

1. My Biology teacher is too harsh.
2. My Biology teacher refuses to answer questions asked by the students during Biology lessons.
3. My Biology teacher's method of teaching is bad.
4. I know that I can never pass Biology except by mistake

Factor 5: Belief about Biology

1. Biology is a very difficult subject
2. No matter how I try I get confused when solving Biology textbooks and note

Factors 6: Unwillingness to make effort

1. Any time I see Biology questions I feel unhappy

Item-Total Correlation Matrix of the Items In Each Of The Sub-Scale Of Biology Guttman Attitude Scale

Table 7 and 8 show the reliability coefficient of factor I (sub-scale) of Biology Guttman attitude scale.

Table 7: Reliability coefficient of factor

Cronbach's Alpha	Cronbach's Alpha Based standardized items	N of terms
0.891	.893	10

The reliability coefficient of factor 1 is 0.891 meaning that all items in the factor are reliable.

Table 8: Reliability coefficient of factor 1 if any of the items deleted

Item	Scale mean if item Deleted	Scale variance if item deleted	Corrected item Total Correlation	Squared Multiple correlation	Cronbach's Alpha if Item Deleted
24 27	26.90 26.85	56.134 57.345	.700 .662	.584 .542	.875 .878
28	26.74	56.759	.750	.614	873
34	27.18	56.698	.625	.446	.881
25	26.76	56.498	.685	.566	.876
26	27.01	56.971	.580	.369	.884
35	26.78	57.450	.706	.538	.876
33	27.20	57.533	.608	.421	.882
29	27.16	59.167	.486	.248	.891
37	26.88	59.193	.536	.336	.887

The above result shows that if any of the items in factor 1 deleted, it will lower the reliability of the factor. Therefore all the ten test items make useful contributions to factor 1.

Table 9: Reliability coefficient of factor 2

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Item	N of Items
.807	.809	6

Table 10: Item total statistic

Item	Scale mean if item Deleted	Scale variance if item deleted	Corrected item Total Correlation	Squared Multiple correlation	Cronbach's Alpha if Item Deleted
11	16.99	11.203	.615	.403	.766
10	16.91	11.393	.577	.348	.776
12	16.73	12.184	.561	.347	.778
9	16.77	12.497	.549	.313	.781
7	16.63	12.587	.571	.366	.777
6	16.73	12.626	.536	.320	.784

The above result shows that if any of the item in factor 2 deleted, it will lower the reliability of the factor. Therefore all the ten test items make useful contributions to factor 2.

Table 12: Reliability coefficient of factor 3

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Item	N of Items
.760	.757	5

The reliability coefficient of factor 3 is 0.760 meaning that all the items in the factor are reliable.

Table 13: Item total Statistics

Item	Scale mean if item Deleted	Scale variance if item deleted	Corrected item Total Correlation	Squared Multiple correlation	Cronbach's Alpha if Item Deleted
39	11.74	11.955	.415	.180	.753
50	12.05	10.275	.593	.356	.692
48	11.92	10.218	.578	.369	.697
47	12.02	10.116	.590	.376	.693
41	11.89	11.475	.460	.216	.739

The above result shows that if any of the items in factors 3 deleted, it will lower the reliability of the factor. Therefore all the ten test items make useful contributions to factor 3.

Table 14: reliability Statistics for Factor 4

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Item	N of Items
.737	.740	4

Table 15: Item-Total Statistics of Factor 4 if any of the items deleted

Item	Scale mean if item Deleted	Scale variance if item deleted	Corrected item Total Correlation	Squared Multiple correlation	Cronbach's Alpha if Item Deleted
13	9.35	7.35	.546	.331	.668
14	8.87	7.87	.623	.402	.625
15	8.79	8.121	.577	.356	.651
22	9.16	8.901	.388	.157	.758

The above result shows that if any of the items in factor 4 deleted, it will lower the reliability of the factor: Therefore all the ten test items make useful contributions to factor 4.

Table 16: reliability coefficient of factor 5

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Item	N of Items
.623	.623	2

Table 17: Item total statistics of factor 4 if any of the items deleted

	Scale mean if item Deleted	Scale variance if item deleted	Corrected item Total Correlation	Squared Multiple correlation	Cronbach's Alpha if Item Deleted
K46	2.42	1.316	.453	.205	.519
K43	2.54	1.473	.453	.205	.524

Due to the that only item loaded on this factor, it would be difficult ot run reliability. But the reliability of these items is stated as .867 thus the item is a good one and should not be removed.

Research question Nine

What are the convergent validity indices of the identified factors of the Guttman Biology attitude scale?

Table 18: Correlation Matrix[a]

		Factor 1	Factor2	Factor 3	Factor 4	Factor 5	Factor 6
Correlation	factors 1	1.000	.377	.619	.554	.377	.293
	Factor 2	.377	1.000	.219	.219	.306	.111
	Factor 3	.619	.363	1.000	.438.	.436	.359
	Factor 4	.554	.219	.438	1.000	.227	.274
	Factor 5	.377	.306	.436	.227	1.000	.230
	Factor 6	.293	.111	.359	.274	.230	1.00
Sig. (1-tailed)	factors 1		.000	.000	.000	.000	.000
	Factor 2	.000		.000	.000	.000	.000
	Factor 3	.000	.000		.000	.000	.000
	Factor 4	.000	.000	.000		.000	.000
	Factor 5	.000	.000	.000	.000		.000
	Factor 6	.000	.000	.000	.000	.000	

a. **Determinant = .227**

This indicated that the six factors are significant at $\propto = 0.000$ (1-e factors where tailed). This table is the Pearson correlation coefficient between all pairs of the factors. The correlation between the factors ranges from 0.111 to 0.619 meaning that the factors were perfectly correlated.

Table 20: Corrected factors-total correlation

	Scale mean if item Deleted	**Scale variance if item deleted**	**Corrected item Total Correlation**	**Squared Multiple correlation**	**Cronbach's Alpha if Item Deleted**
factors 1	54.6404	104.712	.694	.510	.638
Factor 2	64.4474	226.741	.407	.189	.673
Factor 3	69.6988	201.771	.670	.475	.597
Factor 4	72.5526	221.626	.539	.330	.641
Factor 5	79.6374	260.607	.448	.233	.687
Factor 6	82.0058	281.384	.355	.160	.715

Table 18 shows the correlation of each of the sub scale of the Guttman Biology attitude scale with total of the remaining sub-scale. This implies that the factors of the attitude scale correlate moderately well with each factor.

The table also shows the communality of the sub-scale of Guttman Biology attitude scale. The result of the analysis shows that 51% of the variance associated with factor 1 is Common. 18.9% of variance associated with factor 2 is common. 47.5% of variance associated with factor 3 is common. 33% of variance associated with factor 4 is common. 23.3% of variance associated

with factor 5 is common and also for factor 6 16% of variance associated with the factor is common. This indicates that all the factors are measuring the same thing the construct attitude).

Research question ten

Is the Guttman Biology altitude scale reliable? Cronbachs aphla approach was used to answer this research question, the result is presented in table 21.

Table 21: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Item	N of Items
.897	.899	29

Conclusion

It was concluded that since students seem to lack enthusiasm towards Biology teachers should be encourage and watch out for correcting this notion giving the subjects it prime. The study developed an attitude scale which can be used to ascertain students' attitude towards economic, findings reveals 29 items which loaded on six factors (lack enthusiasm towards Biology; positive disposition towards Biology: phobia for Biology: teacher factor to studying economic: beliefs about Biology and unwillingness to make effort.

Educational implication

This study suggests that there is a relationship between the affective domain and cognitive domain. Therefore stakeholder of education should put into consideration that learners or student should not be only assessed based on the cognitive alone but also look into the affective behaviour of the learner's before passing value judgement on them. Also attitude scale should be made available for teachers in secondary school to assess student's attitude on subjects taught in the secondary schools especially Biology so as to provide guidance and counselling for those who have negative attitude to some particular subjects so as to enhance effective outcomes in school assessment and public examinations.

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