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Classroom Variables and Attitude to Learning Basic Technology Among Secondary School Students: Application of Discriminant Analysis

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Abstract

This study examined the effects of classroom variables such as class size, classroom settings, classroom management skills, classroom lightings, proper thermal conditions, student-student interaction, and teacher-student interaction on students with positive and those with negative attitude to learning outcomes in Basic Technology among Secondary school Students in Cross River State. The ex-post facto design was adopted and a sample of 1176 junior secondary school students were drawn through multi-stage sampling technique for data collection. One research question was posed and one hypothesis was formulated to direct the study. Data collection was done, using a questionnaire and an achievement test. The hypothesis was tested at 0.05 degree of significance using the discriminant analysis. The result revealed that there is significant difference in all the classroom variables. Therefore it is recommended that government should invest more on educational system especially on provision of classroom infrastructures to boost student's interest in order to promote an ideal classroom for better learning outcomes.

Keywords: classroom settings, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students interaction.

Introduction

One of the major factors that enhance development is technology. This fact makes it compelling for the educational system to provide the means of improving the economy and advancing the objectivity of teaching and learning. For instance, previous researchers in technology have maintained that technology can be used for creation of wealth, poverty eradication, job creation, global competitiveness and improved learning (Gusen, Olarinoye & Garba, 2006).

Nigeria's National Policy on Education (NPE) asserted that basic technology is a part of general education used for acquainting the students with the basic procedure, material and result of the modern segment (Federal Republic of Nigeria (FRN), 2004).The aim of basic technology was to diminish obliviousness about technology education to the barest minimum among students of secondary school age. To achieve this goal, the subject has three primary goals as was expressed by Federal Republic of Nigeria (FRN, 2004):

To give pre-professional introduction to technology, to give basic mechanical education to regular living and to empower inventiveness. However, in spite of the importance of technology and its relevance as stated in the latest frontline curriculum, students performance in basic technology among Nigerian students is still relatively poor (Uko, 2008). Besides, retention in basic technology among secondary school students is also relatively poor (Uchegbue, 2007)

In addition, attitude towards basic technology is rarely explored in previous studies; this is in spite of the relevance of attitude towards learning. These evidences indicate that further research focused on improving knowledge, skills, verbal reasoning, skill acquisition and attitude in basic technology are required. Ogwa (2002) carried out an investigation on the reasons for poor execution on learners in basic technology, this examination stressed that a few educators did not major in basic technology yet, they instruct students in the subject. The researcher moreover watched that teachers train the students with discretionary school ability. In view of this, it is possible that such teachers cannot interact positively with the students when it comes to basic technology among other variables which could affect students' learning outcome in basic technology. Obanya (2003) as cited in Agbejoye, Aleburu, Obugbaike and Ogunjimi (2015) observed that classroom learning condition and school factors imposed some overwhelming impact on student's accomplishment.

The researcher being worried about the relatively poor execution of learners in basic technology decided to consider other variables which could be responsible for such learning outcome as students' attitude to learning. They include some classroom variables (class size, classroom settings, classroom management skills, classroom lighting, proper thermal condition, student-student interaction, teacher-student interaction. Earthman (2004) developed, "temperature, warming and air quality as the fundamental segments for the instructive achievement of learners". Phillips (2002) expressed that lighting is a champion among the most basic physical uniqueness of classroom. The researcher moreover raised, visual condition could impact the capacity of learners to see visual lifts and besides impact their intellectual disposition. Accordingly, their academic execution is impacted conflictingly. Culp (2006) opined that accomplishment could be guaranteed with visual shows in classroom. As demonstrated by Winter and Wilkinson (2009), opined that there are various pieces of lighting to be reviewed while thinking about this standard run of the mill one for classroom. Classroom lighting contains impalpable light, lighting up at a learner's work area, lighting from projection screens and windows. Awful lighting unfavorably impacts academic achievement and advances wretchedness and impediment for students in the classroom.

Travers (1977) defined attitude as inner states or internal conditions that influence behavior and classifies attitude into three components; namely, affective, cognitive and action component. Joshua (2005) asserted that attitude is a sorted out and continuing arrangement of convictions and sentiments towards some sort of protest or circumstance and an air to carry on toward it especially. Most analysts concur are obtained and in this way subject to genuinely unsurprising change (Simonson and Maushak, 2001) Affective component consist of positive or negative effects or feelings. The cognitive component has to do with the extent to which knowledge and beliefs are involved. Cognitive attitude is highly

intellectual according to the author, often times, these cognitive attitudes are based on a large store of incorrect information and false beliefs. The third component of attitude is action attitude and has to do with physical and visible action towards the object or situation in the environment under consideration.

Muller (2005) asserted that attitudes which are frame works made out of four interrelated qualities: full of feeling reactions, discernments, behavioral expectations, and rehearses. They differentiate in heading (constructive or contrary), the degree (proportion of constructive or adverse inclination), and force (the degree of obligation the individuals has to the position). It was deduced that any conduct that has passionate part exists in the full of feeling area.

Classroom environment evolves from the attitude of the students and teachers within the classroom. Since personality attributes like attitudes are relevant in explaining human behavior, it is necessary to examine the possible relationship between learners' attitude and classroom variables (as cited in Effiong, 2001). Fraser, Giddings, and Mckobbie (2005) carried out an investigation to establish the relationship between student outcomes and the nature of the classroom environment measures. Environment Indices (SLEI) with five scales and attitudinal measures using adapted test-of-science related attitudes. Tosra and Fraser (2008) found out that the relationship between student outcomes and the nature of the classroom environment measures and attitudinal measures adapted test had high reliability indices ranging from 0.70 to 0.90.

Darling-Hammond (2007) in his study, found that learners' states of mind toward a subject and their learning condition affect much on learner's accomplishment. Great instructors are additionally basic to enhancing the educating and learning. From their perspective, Hidi and Harackiewiez (2000) declared that showing practice and instructional choices force incredible impact on the nature of learners' scholarly execution and their inspiration, exertion, and states of mind toward school and scholastic interests. Hardre and Chen (2005), harmonized that these variables likewise advance or lessen learners' learning and accomplishment.

Higgins, S., Corridor, E., Divider, K., Woolner, P. and McCaughey, C. (2005). from their research findings noted that, student's learning outcome can be adversely affected by poor classroom acoustics, steady clamor presentation can likewise harm psychological execution and working. They additionally clarified that, "warm factor alludes to the warming and ventilation of the classroom and are overall out of the teachers' control as they are climate factors. It agrees with a critical part in making classroom environment great and pleasant hence, impacts the lead and execution. Spatial factor relates to the space organization and significantly influences lead particularly on correspondence. Basit (2005) described time factor as, "the traverse of time a learner is adequately appreciating learning process i.e., the length of time the learner put into an instructor - composed lessons and activities." As needs be, from his examination, it is contemplated that physical state of classroom incorporates classroom size and structure, furniture, seating approach, instructional advances, room radiator, rooftop fans, shades, storeroom, equipment, lighting, ventilating system, and so forth.

Narmadha and Chamundeswari (2013) did a research on "learners" state of psyche towards learning of science and scholastic accomplishment in Science among learners at the optional level." Arbitrary testing method was utilized on 422 learners, from the optional level in various frameworks of training. Frameworks included state registration and focal board schools. The attitude toward learning of science scale was utilized to survey the response towards learning science and the imprints scored in science were taken as of their half every year execution.

The information gathered was subjected to factual investigation, to be specific, mean, standard deviation, t-test, F-proportion, Karl Pearson's Product Moment Correlation Co-effective. Outcomes demonstrated that the learners having a spot with the focal board schools have a larger amount of mentality in the midst of learning of science contrasted with learners in state board yet did not vary with learners in registration board schools at the optional level. Correspondingly, learners having a spot with central board schools performed better in science subject appeared differently in relation to the learners in state and enlistment board schools at the discretionary level. The young ladies are basically better in their aura toward learning of science when diverged from the youthful fellows in all groupings of schools. In enlistment and central board schools the young ladies are better than youthful fellows in

their insightful achievement in science however in state board schools there is no basic differentiation in their sexual introduction.

In a quantitative study designed to discover the underlining factors of attitude that impinge on information technology and the relationship among students; Zhwan, Azidah, Rahimi and Khalid, (2015)used a self-developed questionnaire for their purpose. It was found that the attitudes of the respondents evolved in three measurements; to be specific friendship, conduct, and conviction. The outcomes uncovered a measurably huge contrast amongst Arts and Science learners as far as their mentality towards information technology (IT) for science learners, and furthermore demonstrated that there was no factually critical connection between learners' scholastic accomplishment and their dispositions towards IT. While learners at the medium degree of scholastic achievement tended to score higher on the fellowship toward IT differentiating and learners at the elegant degree of the insightful achievement. The results of this examination offer information to course of action makers, and the researchers who are excited about understanding the factors that impact innovation use by learners in their learning.

Purpose of the Study

The main Purpose of the Study is to examine the influence of classroom variables on students' attitude to learning. Particularly, to find the extent to which the following classroom variables (class size, classroom settings, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students' interaction) predict students' attitude to learning basic technology in terms of positive and negative attitude to learning ability.

Research Question

To what extent do the following classroom variables (class size, classroom settings, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students' interaction) clearly distinguish between students with positive and those with negative attitude to learning ability?

Research Hypothesis

The classroom variables (class size, classroom setting, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students interaction) do not significantly predict students' attitude to learning in terms of positive and negative ability.

Research Methodology

The research design adopted was ex-post facto design since the classroom variables considered were already in existence. The research area for this study is Cross River State. Cross River State is one of the thirty-six (36) states of the Federal Republic of Nigeria. The population of the study comprised junior secondary school three (3) students in those schools where Basic Technology is offered from the three educational zones of Cross River State. These are Calabar Education Zone comprising of Akamkpa, Akpabuyo, Biase, Calabar Municipality, Calabar South, Odukpani nearby Government Areas. Ikom Education Zone comprising Abi, Boki, Ikom, Obubra, Yakurr Neighborhood Government Areas and Ogoja Education Zone comprising Bekwarra, Obanliku, Obudu, Ogoja and Yala LGAs. The population for the study is 58816 students. Reason being that Basic Technology is offered from JSS1 to JSS3 and when they get to Junior secondary class three it will be easy and appropriate to measure the outcome, having some definite results. This study involved multi-stages sampling procedure in

order to achieve a representative sample. Firstly, stratified sampling technique was used to draw the sample from the three (3) educational senatorial zones – Calabar, Ikom and Ogoja in the State. Secondly, simple random sampling technique was used to select sixteen (16) Local Government Areas where Basic Technology is offered. Thirdly, purposive sampling technique was also employed to select 45 secondary school offering Basic Technology in the Local Government Areas involved in this study. Fourthly, proportionate stratified sampling technique was used to select 2% of the population of students in the sixteen (16) Local Government Areas. The 2% was chosen in order to generalize the findings to the entire State. Then, process of simple random selection was applied to choose number of students among the JSS 3 students. By this technique, the researcher randomly picked students based on the targeted percent of the sample.

A questionnaire titled Attitude to Basic Technology (ABT) was used to determine students responses to learning whether negative or positive at the end of the study.

Results

The classroom variable (class size, classroom setting, classroom management skills, classroom lighting, proper thermal conditions, student-student interaction, teacher-student interaction) do not significantly predict students' attitude to learning. The dependent variable is Students' positive and negative attitude group to learning, while the independent variable is classroom variable (consisting of class size, classroom setting, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-student interaction).This hypothesis was tested using discriminant technique. The results are presented in Tables below.

Table 1: Group statistics for attitude to learning

	Low		High		Total	
	Mean	**Std.**	**Mean**	**Std.**	**Mean**	**Std.**
Classroom setting	11.59	2.770	12.68	2.698	12.05	2.791
Student-student interaction	12.11	2.928	12.95	2.897	12.47	2.943
Teacher student interaction	11.62	2.773	12.98	2.738	12.20	2.838
Classroom lightings	12.11	3.066	13.53	2.612	13.06	2.968
Classroom management	12.33	2.820	13.36	2.612	12.76	2.779
Thermal condition	11.48	3.109	12.87	3.009	12.07	3.141

N for negative mean=640N for positive mean=448

Table 2: Tests of equality of group means of classroom variables

	Wilk's Lambda	**F**	**p-level**
Classroom setting	.994	41.762	.000
Student-student interaction	.997	22.319	.000
Teacher-student interaction	.993	64.844	.000
Classroom lightings	.999	20.718	.000
Classroom management	.998	37.811	.000
Thermal condition	.984	54.374	.000

df =1, df2= 1086

Table 3: Log determinants-attitude to learning

Attitude to learning	**Rank**	**Log determinants**
Negative attitude to learning group	6	11.770
Positive attitude to learning group	6	11.264
Pooled within-group	6	11.616

Table 4: Box's M test result of the variance in the different classes of classroom variables

Box's M	66.527
F Approx.	3.149
df1	21
df2	3651168.485
Sig.	.000

Tests null hypothesis of equal population covariance matrices

Table 5: Eigen values of the discriminant functions derived from the discriminant variables of students' classroom variables

Function	Eigenvalue	% of variance	Cumulative %	Canonical correlation
1	0.21	100.0	100.0	.302

Table 6: Wilk's Lambda of the discriminating power of the classes from the discriminant variables of students' classroom variables

Test of Function	Wilk's Lambda	Chi-square	Df	Sig.
1	0.979	22.546	6	.000

Table 7: Standardized canonical discriminant function coefficients and structure matrix in the prediction of class of students' classroom variables

Classroom variables	Standardized canonical discriminant Function	Structure matrix functions
Classroom setting	.335	.620
Student-student interaction	-.076	.453
Teacher-student interaction	.450	.772
Classroom lightings	.059	.179
Classroom management	.213	.590
Thermal condition	.464	.707

Pooled within-groups correlation between discriminating variables and standardized canonical discriminant functions. Variables ordered by absolute size of correlation.

Table 8: Functions at group centroids

Attitude to learning groups	Functions
	1
1. Negative attitude to learning group	-.273
2. Positive attitude to learning group	.367

Table 9: Classification function coefficients

Classroom variables	Attitude to learning	
	Negative	Positive
Classroom setting	763	.841
Student-student interaction	.373	.356
Teacher-student interaction	.439	.544
Classroom lightings	.695	.708
Classroom management	.687	.737
Thermal condition	.566	.663

(Constant)	-21.688	-25.993

Table 10: Classification results

Attitude to learning groups			Predicted group membership		Total
			Negative	Positive	
Original	Count	Negative attitude to learning group	499	125	640
		Positive Attitude to learning group	275	189	376
	%	Negative attitude to learning group	80	20.0	100.0
		Positive Attitude to learning group	59.3	10.0	100.0

62.7% of original grouped cases correctly classified.

Fisher's linear method using stepwise discriminant analysis was used. This enabled the variables entered at each step to be minimized by Wilk's Lambda. From Table 1 above, the means and standard deviations of classroom variables indicates that Classroom setting ($\bar{x} = 12.05, SD = 2.791$), Student-student interaction ($\bar{x} = 12.47, SD = 2.943$), Teacher-student interaction ($\bar{x} = 12.20, SD = 2.838$), Classroom lightings ($\bar{x} = 13.06, SD = 2.968$), Classroom management ($\bar{x} = 12.76, SD = 2.779$), Thermal condition ($\bar{x} = 12.07, SD = 3.141$).

The result in Table 2 revealed that Classroom Setting (Wilk's Lambda = .994F = 41.762, df1 = 1, df2 = 1086 and sig, = .000); Student-student Interaction (Wilk's Lambda = .997, F = 22.319, df1 = 1, df2 = 1086 and sig. = .000); Teacher Student Interaction (Wilk's Lambda = .993, F = 64.844, df1 = 1, df2 = 1086 and sig. = .000); Classroom Lightings (Wilk's Lambda = .999, F = 20.718, df1 = 1, df2 = 1086 and sig. = .000); Classroom Management (Wilk's Lambda = .998, F = 37.811, df1 = 1, df2 = 1086 and sig. = .000) and Thermal Condition (Wilk's Lambda = .984, F = 54.374, df1 = 1, df2 = 1086 and sig. = .000). This result on the test of equality of group means shows a strong statistical evidence of significant differences in all the classroom variables.

The result in Table 3 revealed that the log determinants appeared similar to table 4 result with Box's M value of 66.527 and F = 3.149 which is significant ($p< 0.05$). However, because of large sample size, the significant result is not regarded as too important. From Table 5, the number of discriminant functions computed is one. Function 1 had an Eigen value of 0.21 which accounted for 100% of the variance in the classroom variables. Table 6 gave Wilk's Lambda = 0.979, $\bar{x} = 22.546$ and $p< 0.05$. This shows a significant difference between the variables.

Table 7 showed the standardized Canonical discriminant Function coefficients of classroom variables Classroom setting (.059), Student-student interaction (- .076), Teacher-student interaction (.450), Classroom lightings (-.167), Classroom management (-.213), Thermal condition (.464).

The result of the structure matrix in Table 7 was used to decode the language for the function: Classroom setting (.620), Student-student interaction (.453), Teacher-student interaction (.772), Classroom lightings (.179), Classroom management (.590), Thermal condition (.707). The classification result presented in table 10 indicates that 62.7% of the original grouped cases were correctly classified.

The group centroids as presented in Table 8 are unstandardized canonical discriminant functions evaluated at group means. They portray the distance between the groups from the mean or zero point of the discriminant function. These formed the basis for the comparison. The centroids (group means) for group 1, the negative attitude to learning (-.273) are quite far apart, when compared to that of group 2, the positive attitude to learning (.367), with a mean discrepancy of 0.640.

Table 9 shows the classification function coefficients for the negative and positive groups. The accuracy of the discriminant function in the classification of subjects in the negative and positive attitude to learning groups was also examined. The discriminant function generated was used to predict group membership among subjects used in the study.

Therefore, in finding the efficiency of discriminant analysis in predicting students' attitude to learning in secondary schools, discriminant analysis was used to show the extents to which classroom variables predict attitude to learning. The predictor variables were Classroom setting, Student-student

interaction, Teacher-student interaction, Classroom lightings, Classroom management and Thermal condition. Significant mean differences were observed for all the predictors on dependent variables. While the log determinants were quite similar, Box's M indicated that the assumption of equality of covariance matrix was violated. However, given the large sample size, this problem was not considered serious. The function had an Eigen value of 0.21 representing 100% of the variances in the classroom variables.

The contribution of the function in predicting students' attitude to learning revealed that the function significantly predicts the students' attitude to learning. Also, 62.7% of the original classes of classroom variables were accurately predicted. This indicates a high efficiency. The result also showed that the variables were correctly classified.

Discussion

Classroom variables and students attitude to learning.

1. The classroom variables (class size, classroom setting, classroom management skills, classroom lightings, proper thermal condition, student-student interaction, teacher-students interaction) separately and collectively significantly predict students' attitude to learning. Considering the outcome of trial of uniformity of gathering implies for attitude to learning, on Table 2,the following observations emerged;
2. All the classroom variables investigated were statistically significant in varying degrees.
3. The variables that contributed most to discriminating between the two groups are: thermal condition, teacher-student interaction and classroom setting. Those that contributed least in discriminating between the groups are: student-student interaction; classroom management; and classroom lightings.

The Wilk's Lamda and associated Chi-square indicated a significant variation between positive and negative students' attitude to learning, such that, one discrimination function was generated, which accounted for 100% of the relative variance.

The above findings lend credence as to which variables to stress for optimal learning outcomes in technology at the Junior Secondary tier. Thus, thermal condition, teacher-student interaction and classroom setting are clearly significant and desirable for implementations by basic technology teachers at junior secondary school level. The findings of Linn (2000) and Boyle, Lamprianou, and Boyle (2005) buttressed the assertion that thermal condition, teacher-student interaction and classroom setting are clearly significant and desirable for implementations by basic technology teachers at junior secondary school level. On the other hand, though equally important, students-students interaction, classroom management skills impinged on learning outcomes slightly less significantly. This finding, in line with Hammond (1997) noticed that learners' states of mind toward a subject and also their learning condition subsequently affect on school accomplishment. Excellent instructors are basic to enhance the educating and learning encounters in the classroom. Hidi and Harackiewiez (2000) clarified that showing practice and instructional choices impact the nature of learners' scholastic execution and their inspiration, exertion, and states of mind toward school and scholarly interests. Hardre and Chen(2005) concurred that they likewise advance or lessen learners' learning and accomplishment. Research discoveries including both auxiliary and more seasoned learners seem to demonstrate a relationship, between educators' practices and learners' states of mind towards science. (Haladyna, Olsen and Shaughnessy, 1982; Myers and Fouts, 1992). Myers and Fonts (1992) clarified that kids with uplifting states of mind towards mechanical science will probably be found in classrooms that have large amounts of learner inclusion, instructor support, and utilization of inventive educating techniques. Jarvis and Pell (2005) demonstrated that educators' showing styles and instructional choices are the most perceptible factors in learners' attitude to technological science learning.

Communication competence and seasoned classroom management skills were lacking regrettably among teachers and students in the study locale visited and observed. In agreement with Avery (2003) educators who are ordinarily worried about classroom administration but are deficient in communication skills have an uphill task making a success of teaching basic technology competently to their students. This unpleasant drawback, for both teachers and students does not portend the proper technological development opportunities for our younger generation and society at large.

Conclusion

From the findings of the study, the researcher is able to draw the following conclusions. The classroom variables considered; (class size, classroom setting, students-students interaction, teacher-students interaction, classroom lighting, classroom management skills, thermal condition) are best predictors of the considered learning outcomes and the discriminant analysis is best used as a tool on classroom variables for the prediction of attitude to learning where the underlying assumptions are met. Reason being that three (3) out of six(6) independent variables showed significant mean difference in their predictions. Also, considering log determinant (Box's M) and function (Eigen value), they both significantly predicts the students 'attitude to learning. Bringing it to about (80.1%) significance. Hence classroom variables (classroom setting, student-student interaction, teacher-student interaction, classroom lighting, classroom management skills, thermal condition) are significant predictors for predicting attitude to learning.

Recommendations

1. Curriculum planners should deliberately include a means of monitoring and evaluation techniques for assessing desirable attitude to learning in graduating students (JSS3&SS3).
2. Parents should be properly sensitized on the essence of stimulating their children/wards academically to enhance attitude to learning.
3. Students should be convinced to imbibe a good study habit and attitude to promote attitude to learning.

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