Educational Statistics: Postgraduate Students' Attitude as Predictor of Achievement

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Abstract
This study seeks to ascertain the relationship between students' Attitudes toward Statistics and graduate students' achievement in Statistics in the University of Benin, Nigeria. The population of interest is the students in the Postgraduate Programs of the Faculty of Education. Sample of one hundred students were selected from the population. Measure of Attitude towards Educational Statistics was done using an adopted "Survey of Attitudes toward Statistics" (SATS-36 pre) Questionnaire (Schau, 2003). The instrument was subjected to a Reliability test, a Reliability Coefficient of .88 was obtained for the entire scale while .82, .87, .79, .77, .78, and.76 were obtained for the sub-scales (Affect, Cognitive Competence, Value, Difficulty, Interest and Effort) respectively. Achievement in Educational Statistics measure was obtained from the students' Mid-semester test and end of course final examination result. Findings revealed that the general students' Attitude toward Statistics does not predict Achievement. However, some of the components of attitude did. It was recommended that program should be put in place for fresh students to help them develop a more positive attitude in terms of value, difficulty and interest, before the commencement of the course lectures to enhance their end of course achievement.

Key words: *Educational Statistics, Attitude towards Educational Statistics, Achievement in Statistics, Correlate of Achievement, Predictor of Achievement,*

I.   Introduction

Postgraduate programs at the masters' level in universities are designed for students who have previously obtained a First Degree from a tertiary institution of learning. The students are presumed to be academically sound and capable of carrying out independent studies with less supervision. The presumed importance of Educational Statistics has earned it the position, as one of the compulsory courses at the postgraduate levels. The program is believed to consolidate on students past knowledge in Introductory Statistics obtained at the undergraduate level and introduce the student to the practical application of statistics in various fields; be it Sciences, Humanities or Arts. Education Faculty, University of Benin, has eight academic departments offering various academic programs, in all these departments and programs, participating and having a credit pass in Educational Statistics is a core requirement for the award of the Degree of Master in Education. Students are also required to carry out a research work as a compulsory requirement for the ward of the degree.

Research in Education can be qualitative or quantitative in nature, in Quantitative Research statistical analysis of numerical data is inevitable, therefore, the Postgraduate student is expected to be grounded in Statistical or Quantitative Methods. The Postgraduate program in the Faculty of Education, University of Benin is designed to accommodate Educational Statistics (EDU802) in all the Departments, course of study notwithstanding.

From academic records and interactions with students, it has been the case that achievement in Statistics seems poor and students expressed frustration with respect to the course and often associate it with their misery and a burden. In the word of Manuel, Fenton and Philemon (2013) Students have approached disciplines of a numerical nature with fear and have negative attitudes towards them. Many students perceived Statistics as difficult (Medallon, 2016), while some do not see the need for Statistic, a student once asked me "what is the value of this statistics in real life situation?" statistics is seen by many, as of no value in real life and that they just have to bear while pursuing a Masters' Degree. This negative attitude expressed by students could be a determining factor in their achievement in the course educational statistics.

Attitude towards Statistics as a construct has been sub-divide into six sub-factors -Affect, Cognitive Competence, Value, Difficulty, Effort and Interest- (Schau, 2003). Affect- is concerned with positive or negative feelings; Cognitive Competence - is about student ability and intellectual knowledge and capacity;

Value - deals with attitude in terms of usefulness, importance, relevance or worth; Difficulty - this is how student perceived statistics to be easy or hard; Effort - this has to do with how much effort they are willing to expend on Statistic study and problems while Interest- deals with how interested in Statistics the students are. Studies have reported the attitude of students towards statistics for example Ashaari, Judi, Mohamed and Wook (2011) reported that students have positive attitude towards some of the components of attitude, but, Affect and Interest were negative. Also Zhang, Shang, Wang, Zhao, Li, Xu and Su (2012) reported that students have positive attitude towards statistics. In their study, postgraduate medical students were the population, however, they reported negative attitude in difficulty. In the same vein Griffith, Adams, Gu, Hart, and Nichols-Whitehead (2012) asserted that 63% of the respondents to the instrument had positive attitude while Rosli, Maat, and Rosli (2017) in their study with education students reported a neutral position, as they said that their attitude was moderate across the sub-scales. Other researchers that have studied Attitude towards Statistics are Mutambayi, Odeyemi, Ndege, Mjoli and Qin;, 2018; Oliveira Junior, Zamora, Azevedo de Oliveira, Costa de Souza, (2018).

Achievement in Statistics is documented in literature by some researchers, Chiesi and Primi (2010); Oliveira Junior, Zamora, Azevedo de Oliveira and Costa de Souza, (2018) among others. It is also reported that Attitude towards an academic subject is associated with achievement in that subject. (Wisenbaker, Scott, & Nasser, 2010; Kpolovie, Joe & Okoto, 2014) in the same vein Li, (2012); Naccache, (2012) ; Medallon, (2016) and Valentin and Sajise, (2018) reported a significant relationship between attitude and academic achievement in Statistics while Sorge & Schau, (2002) reported a significant fit between attitude and academic achievement in Statistics in their structural model. Attitude towards a school subjects have been investigated by researchers to find out if it can predict academic achievement in the subject, Kassim and Abayomi (2016) reported the predictive nature of attitude with respect to Achievement in Economics while Bastug, (2014) found that Reading Attitude could predict Academic Achievement. In the same vein Gopal, Salim, and Ayub, (2018) reported that Attitude towards Statistics significantly predicted Academic Achievement in Statistics. Medallon, (2016) also reported that attitude towards statistics significantly (F=6.35, p=.000) predicted achievement in statistics and also the components of attitude towards statistics predicted achievement in statistics; attitude towards stat –difficulty (p=.047) however, attitude towards stat –cognitive (p=.091) was not. Though some researchers; Iovu, Runcan & Runcan, (2015) have reported that attitude could not significantly predict achievement. This study investigates and explains the predictive power that exists among the components of attitude and achievement in Educational Statistics. The participants in this study are Postgraduate Education Students, unlike most other studies, which have used undergraduates, students from other discipline that are not Education students but one, as well as introductory course in Statistics, also, the researcher had not come across any study that had used the SATS for Nigeria students. The researcher provides this; the following research questions and hypotheses guided this study.

Research Questions
1. What is the attitude of postgraduate students in education towards Statistics?

2. What is the level of students' academic achievement in Educational Statistics?

3. Does Attitude towards Statistics predict Achievement in Educational Statistics?

4. Will components of Attitude towards Statistics predict Achievement in Educational Statistics?

Research questions one and two were answered directly, while 3 and 4 were hypothesized as hypotheses 1-2 respectively.

Hypotheses
1.   Students' Attitude towards Statistics will not significantly predict Achievement in Educational Statistics

2.   Components of Attitude towards Statistics will not significantly predict Achievement in Educational Statistics

II.   Method
The Survey Design was adopted in this study ; the population is 254 while a sample of 100 was drawn from Postgraduate students enrolled in the eight departments in the 2019/2020 academic session, however only 82 were analyzable after administration of the instrument due to incomplete information. An adopted "Survey of Attitude towards Statistics" (SATS-36 pre) Questionnaire (Schau, 2003) was utilized for attitude data collection, the instrument was obtained by request from the developer. The instrument is a 7-point Likert scale

type ranging from Strongly Disagree (SD) = 1 to Strongly Agree (SA) = 7, negatively word items were reversed so that a high score would indicate positive attitude. Reliability test was done for "SATS-36 pre" a Reliability Coefficient of .88 was obtained for the entire scale while .82, .87, .79, .77, .78, and.76 were obtained for the sub-scales (Affect, Cognitive Competence, Value, Difficulty, Interest and Effort) respectively. While the Mid-semester Test and end of course examination scores were measures of achievement in Educational Statistics. Descriptive Statistics (Mean, Standard Deviation) were the criteria for decision making with respect to the research questions the theoretical and empirical means are compared while for academic achievement the obtained average percent was compared with 50% of the total score obtainable in achievement. For the hypothesis, Inferential Statistics (Linear Regression) was employed in data analysis, $p < .05$ was the set criterion for rejecting the null hypotheses, all analysis were done using the Statistical Package for Social Scientist (SPSS) Version -20.

III. Results

1. What is the attitude of postgraduate students in education towards Statistics?

Table 1: Mean and Standard Deviation of Students Attitude towards Education Statistics

Attitude	N	Empirical Mean	Std.Dev	Maximum obtainable score	Theoretical Mean	Remarks
Composite	**82**	**153.61**	**24.61**	**252.00**	**144.00**	**Positive**
Affect	82	**25.11**	6.15	42.00	**24.00**	Positive
Cognitive	82	**25.28**	6.65	42.00	**24.00**	Positive
Difficulty	82	**27.56**	4.87	49.00	**28.00**	**Negative**
Value	82	**40.64**	6.26	63.00	**36.00**	Positive
Interest	82	**18.41**	5.07	28.00	**16.00**	Positive
Effort	82	**16.59**	6.76	28.00	**16.00**	Positive

Note- Number of items: Affect, Cognitive = 6 each, Difficulty = 7, Value = 9 and Interest, Effort = 4 each.

Table 1 shows the descriptive data with respect to Attitude of Students towards Education Statistics. Total respondents N = 82, the respondents have a mean of 153.61 ± 24.61 standard deviation. The empirical mean is greater than the theoretical mean (153.61 > 144.00). This implies that the Attitude of Students towards Education Statistics is positive. Also with respect to the components all were positive but difficulty.

2. What is the level of Postgraduate students' achievement in Educational Statistics?

Table 2 Mean and Standard Deviation of Students achievement in Education Statistics

Variable	N	Maximum score obtained	Minimum score obtained	Average score obtained	Std.Dev	Remarks
Achievement	82	**82%**	**42%**	**59.33%**	9.77	**Good**

Table 2 shows the descriptive data with respect to Students achievement in Educational Statistics. Total respondents N = 82 they have an average score of 59.33% ± 9.77 standard deviation. The obtained average is greater than 50%. Hence it would be concluded that the students have a more than average ability, it can be considered as a good achievement.

Hypotheses

1. Postgraduate students' Attitude towards Statistics will not significantly predict their Achievement in Educational Statistics

Table 3: Simple Linear Regression of Attitude towards Statistics on Achievement in Educational Statistics

Model		Sum of Squares	df	Mean Square	F	*Sig (p-value)*
1	Regression	226.800	1	226.800	2.417	.124
	Residual	7505.309	80	93.816		
	Total	7732.110	81			

Table 3 shows the simple linear regression result of Attitude towards Statistics on Achievement in Educational Statistics. From the table F= 2.417, *P-Value* = .124. Testing at alpha level of .05 the *F-Value* is not significant

(.124 > .05). Therefore the null hypothesis that says "Postgraduate students' Attitude towards Statistics will not significantly predict their Academic Achievement in Educational Statistics" is retained.

Table 4: Model Summary of Simple Linear Regression of Attitude towards Statistics on Achievement in Educational Statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.171[a]	.029	.017	9.68589

Table 4 shows Model Summary of Simple Linear Regression of Attitude towards Statistics on Achievement in Educational Statistics. The *R Square* of .029 is an indication that the variable "Attitude towards Statistics" accounted for a mere 2.9 % (.029 multiply by 100) changes in the value of Achievement in Educational Statistics among postgraduate students.

2.　　　Components of Attitude towards Statistics will not significantly predict Achievement in Educational Statistics

Table 5: Multiple Linear Regression of the components of Attitude towards Statistics on Achievement in Educational Statistics

Model		Sum of Squares	df	Mean Square	F	*Sig (p-value)*
1	Regression	1182.598	6	197.100	2.257	.047
	Residual	6549.512	75	87.327		
	Total	7732.110	81			

Table 5 shows the multiple linear regression result of the components of Attitude towards Statistics on Achievement in Educational Statistics. From the table *F= 2.257, P-Value = .047*. Testing at alpha level of .05 the *F-Value* is significant *(.047 < .05)*. Therefore the null hypothesis that says "Components of Attitude towards Statistics will not significantly predict Academic Achievement in Educational Statistics" is rejected in favour of the alternative hypothesis.

Table 6: Model Summary of Multiple Regression of Attitude on Achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.391[a]	.153	.085	9.34488

Table 6 shows that the components: affect; cognitive competence; value; difficulty; interest and effort predicted Achievement in Educational Statistics. The *R Square* of .153 is an indication that the variables jointly accounted for a 15.3 % (.153 multiply by 100) changes in the value of Achievement in Educational Statistics among postgraduate students. Though it may be necessary to see the magnitude of the individual variable contribution to the dependent variable

Table 7: Multiple Regression Coefficient Values of Components of Attitude

Model		Unstandardized Coefficients		Standardized Coefficients	t	*Sig (p-value)*
		B	Std. Error	Beta		
1	(Constant)	50.801	8.960		5.670	**.000**
	Affect	.049	.241	.031	.201	.841
	Cognitive	.081	.227	.055	.357	.722
	Value	-.477	.209	-.305	-2.285	**.025**
	Difficulty	.436	.215	.217	2.021	**.047**
	Interest	.521	.262	.270	1.985	**.051**
	Effort	.184	.195	.127	.946	.347

Table 7 the coefficient values of the independent variables (affect; cognitive congruence; value; difficulty; interest and effort) from these values, it can be observed that "value", "difficulty" and "interest" were significant in the equation while others were not.

IV.　　Discussion

The analyzed data revealed that, the students have positive attitude towards statistics but contrary to Fenton and Philemon (2013) who reported that students do approach disciplines of a numerical nature with fear and have negative attitudes towards them. However, this finding is partly in agreement with Ashaari, et.al. (2011). they reported a positive attitude in Difficulty component among the factors while negative in Affect and Interest, whereas, it was neutral in other components factors. The students' attitude being positive as reported in

this study may stem from the fact that these are more matured students (postgraduates) in terms of academic and emotional stability.

Though statistics as a numerical science and computationally demanding the students seems to still show some level of affection, capability, interest and effort , at the same time believed in the utility value of it. The presumed poor performance in EDU802 notwithstanding the students demonstrated some level of competence by way of having an average score of 59.33%. Though the maximum score obtained by the students stood at 82% while the minimum was 42% the overall achievement going by the university grading system a score of 59.33% is a Credit Pass (C).This findings may not be unconnected to the fact that the population of this present study consist of graduate students whom are presumed to be more mature academically and psychologically and have had a fill of statistics before at the introductory level and as such are better prepared to handle issues in statistics. Be that as it may, the score of 59.33% may not suffice for a student who may have the intention of climbing higher the academic ladder to the next higher level the doctoral level of academics.

Attitude in this study was not a significant predictor of achievement *(p>.05)*. This finding is supported by that of Iovu, Runcan & Runcan, (2015); but contrary to the findings of Gopal, Salim, & Ayub, (2018); Kassim & Abayomi (2016) and Medallon, (2016). The components- affect, cognitive competence, and effort did not predict achievement unlike difficulty, value and interest. The findings can be compared to that of Sorge & Schau, (2002) who reported that Difficulty, Cognitive Competence, and Affect were positively related to achievement. .Again attitude being a combination of personality, beliefs, values, behaviors, and motivations and since it can be learnt and modified, the passage of time may have contributed to the fact that the graduate students are no longer perturbed by the seemingly difficulty, worthlessness the undergraduates have for statistics. This could be seen from the report when value, difficulty and interest were the only significant components of attitude that predicted achievement. The students may have seen statistics as seemingly difficulty that may have stirred up a desire to succeed in them which may have accounted for the inability of fear to determine the outcomes again some level of fear and anxiety may actually be beneficial.

V. Conclusion

From the findings, it is concluded that graduate students in education faculty have positive attitude towards educational statistics and that their achievement in educational statistics is good. It was also found that the composite: attitude towards statistics did not significantly predicts academic achievement in educational statistics and that affect, cognitive competence and effort as components of attitude did not predict achievement but, value, difficulty and interest did.

Recommendations
Based on these findings, it is recommended that;
1. Program should be put in place for fresh graduate students to help them develop a more favourable disposition in terms of value, difficulty and interest, before the commencement of lectures to enhance their end of course achievement in Educational Statistics.

Acknowledgments

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