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RESEARCH ARTICLE

ROLE OF GENDER AND ACADEMIC SELF-EFFICACY ON STUDENT'S ATTITUDES TOWARDS STATISTICS

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Abstract

Statistics is an essential subject in the educational landscape of Nigeria and a critical topic in the development of scientific reasoning. Perhaps, the students confront statistics with varying attitudes. The purpose of the current study was to investigate the variations in attitude towards statistics based on gender and academic self-efficacy. One hundred and twenty-eight undergraduates pooled from different public universities in the Anambra State of Nigeria participated in the study. A cross-sectional survey design was adopted. The participants completed a self-report measure of Survey of Attitude toward Statistics (SATS-36), initially developed by Schau (2003), and the College Academic Self-Efficacy Scale (CASES) created by (Owen & Froman, 1988). A multiple regression analysis was performed on the data, and the result established a statistically significant interaction between the independent and dependent variables. It was concluded that gender and academic self-efficacy are essential determinants of the variation in attitude towards statistics. The study recommends that relevant persons consider this interactional effect of the variables.

Introduction:-

Statistics is the discipline and, perhaps, the art of learning from data (Lieten, 2005). As a discipline, it focuses on data collection, analysis, interpretation, effective communication, and demonstration of outcomes based on data. Statistics describe quantitative reasoning required to make vital advances in the sciences and makecritical business and public policy decisions. Statistics is crucial in the modern education system (Eichler & Zapata-Cardona, 2016). Statistical procedures are essential in the quality and precision of any scientific work (Annapurna, 2017; Olivier & Bell, 2018). As an emerging academic discipline (Garfield & Ben-Zvi, 2007; Groth, 2015; Jose, 2017), it makes a vital contribution to society. Accordingly, numerous research work has been dedicated to statistics (Ben-Zvi & Garfield, 2008; Chew & Dillon, 2014; Sharma, 2017). Conceivably, pedagogical approaches and learning outcomes relating to statistics have received significant scholastic attention (Fioravanti et al., 2019; Veloo et al., 2018). More so, its significance has been emphasized in various domains such as health, data mining, psychology, biophysics, and economic development (Coggon, 2015; Frost, 2017; Gupta &Nitin., 2020; Ribeiro et al., 2017; Shangodoyin & Lasisi, 2011; Tamm, 2019; Verma & Verma, 2019; Wiberg, 2009).

Within the context of Nigerian higher learning, statistics occupy a central position in that every student, regardless of the field of studies, are exposed to the concept of statistic. Perhaps, most courses demand that students possess basic statistical knowledge such as data representation, data distribution, probability, sampling, and statistical

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inferences. Consequently, research has underscored students' perception of statistics (Field, 2002; Gopal et al., 2020; Murtonen & Lehtinen, 2003). This is due to the poor mathematical background (Dempster & McCorry, 2009; Lavldas et al., 2020). Perhaps, the preconceived attitudes towards statistics are reflected in the anxiousness associated with statistics (Cui et al., 2019; Faber & Drexler, 2019; Li et al., 2018; Malik, 2015; Najmi et al., 2018; Onwuegbuzie, 2004; Siew et al., 2019; Smith & Capuzzi, 2019; Tonsing, 2018; Vahedi et al., 2012; Walsh & Ugumba-Agwunobi, 2002; Williams, 2010). Thus, attitude is an essential component in the statistics literature.

The term attitude is commonly applied to describe an individual's evaluative style towards any aspect of the socio-world. Attitude symbolizes the formative evaluation of a given stimulus. Similarly, a student's attitude reflects their tendency to respond positively or negatively towards a situation, including a subject. Accordingly, a positive attitude has been linked with high commitment and vice versa (Kurniawan et al., 2019). More so, attitudes have been implicated in improved performance (Dempster & McCorry, 2009; Rosli & Maat, 2017). Relatedly, previous studies have explored numerous correlates of attitude towards statistics (Arumugam, 2014; Ashaari et al., 2011; Budé et al., 2012; Gerald & Allan, 2018; Gómez et al., 2012; Judi et al., 2011; Koparan & Güven, 2008; Mustam et al., 2020; Nguyen et al., 2016; Saidi & Siew, 2018). However, the present study is focused on the effect of gender and academic self-efficacy on attitude towards statistics.

Gender and attitude towards statistics

Gender is an essential variable found to determine various aspects of human behavior. The gender variable reflects the physiological differences associated with certain outcome variables, such as attitudes. Prior studies on gender-related attitudes toward statistics have produced contradictory outcomes. For example, the research by Hommik and Luik (2017) reported a positive gender variation in attitude towards statistics. Conversely, some findings suggested no significant gender differences in attitudes towards statistics (Estrada et al., 2005; Judi et al., 2011; Martins et al., 2002), while some found the female to exhibit more positive attitude (Fullerton & Umphrey, 2001; Mahmud & Zainol, 2008). Also, others revealed that males are more likely to show negative attitudes (Tempelaar & Nijhuis, 2007). Perhaps, the discrepancies in gender roles relating to statistics attitude suggest more inquiries.

H1: Gender would significantly predict student's attitudes towards statistics

Academic self-efficacy and attitude towards statistics

Self-efficacy denotes one of the social-psychological concepts symbolizing a person's belief in accomplishing a specified task without help from others (Bandura, 1977). The construct is implicated in academic achievement and future endeavors. In addition, research indicates that self-efficacy contributes significantly to students' motivation, interest, and overall engagement (Webb-Williams, 2018). Academic self-efficacy is one of the many domains of self-efficacy that describes a student's belief in accomplishing a desirededucational objective by own self. Literature abounds that supports the linkage between academic self-efficacy and academic engagement and performance (Honicke & Broadbent, 2016; Liu et al., 2020; Ogunmakin & Akomolafe, 2013; Onu et al., 2021; Ugwu et al., 2013). Self-efficacy has several effects on thought patterns and responses. Thus, people with low academic self-efficacy tend to perceive tasksas more complex than they are. High academic self-efficacy tends to propel people to believe that studies are more straightforward and achievable without help. This often triggers the variation in students' responses. Although the study variable has received huge research attention in various domains, research looking at their effect on statistics attitude remains rare in the context; hence the present study expects its impact on statistics attitudes

H2: Academic self-efficacy would significantly predict student's attitudes towards statistics

Method:-

A survey research design was adopted in the study. The current study population included undergraduate students enrolled in different tertiary institutions in the Anambra State of Nigeria. Two hundred and eight (n = 128) students were recruited from three public tertiary institutions in Kogi State as the research participants. The students were mainly pooled from the year one class and comprised males and females in various faculties and departments. The students were approached in their classes and hostels with permission from the school authorities. Those who passed the study criteria were asked to participate in the survey to understand their attitude towards statistics. Thus, only those who consented to participate were given the study instruments.

Measures:-

Attitude towards statistics was measured using the Survey of Attitude toward Statistics (SATS-36) initially developed by Schau (2003). The 36 items, Linkert-type scale is scored in a 7- point format ranging from (1) strongly disagree to (7) strongly agree. Items in the scale were modified to suit the present context. Cronbach alpha .78 was recorded in this study.

Academic self-efficacy was assessed using the College Academic Self-Efficacy Scale (CASES) initially developed by (Owen & Froman, 1988). The scale measures students' confidence in completing the academic-related tasks associated with success. The scale was adapted and modified for this study. The revised scale contains a five-point Likert-type scale measuring degrees of confidence. Higher scores indicate higher college academic self-efficacy. The Cronbach alpha .78 coefficient was obtained in the scale.

Result: -

Multiple regression was run to test the main hypotheses to predict the variation in attitude towards statistics from gender and academic self-efficacy. The multiple regression model showed that gender and academic self-efficacy statistically significantly predicted attitude towards statistics, F (2, 126) = 31.205, p < 0.05, adj. R^2 = .549. All two variables added statistically significantly to the prediction, p < .05. The result indicates that the predictor variables contributed 54.9% of the variance in the attitude towards statistics.

Table 2:- The table shows the multiple regression results of gender and academic self-efficacy on attitude towards statistics.

		95% CI for B						
	B	LL	UL	SEB	β	*R*	t	Sig
						.549		
Constant	6.38	5.99	6.77	.19	32		.61	.000
Gender	-.19	-.29	-.09	.05	-.13		-4.04	.000
Academic Self-efficacy	-.18	-.27	-.09	.06	-.16		-3.99	000

Note. B = Unstandardized regression coefficient; CI = Confident Interval; LL = Lower Limit; UL = Upper Limit; SEB = Standardized error of the coefficient; β = Standardized coefficient; R^2 = Coefficient of determination, ΔR = Adjusted R^2. *P<.000.

Discussion:-

The current study was conducted to determine whether gender and academic self-efficacy would predict the variation in attitude towards statistics. It was expected that the gender and academic self-efficacy would significantly contribute to the statistics attitude variation. Indeed, the multiple regression analysis conducted on the data established a statistically significant association between the variables and attitude towards statistic F (2, 126) = 31.205, p < 0.05, adj. R^2 = .549. This means that the expectation of the study was affirmed. The study results indicate that gender positively predicts attitude towards statistics. Thus, the finding corroborates previous results (Hommik & Luik, 2017), which found gender among the predictors of attitude towards statistics. This means that the differential attitudes among students regarding statistics are partially explained by their gender.

Conversely, the finding differs from the findings of similar studies (Estrada et al., 2005; Judi et al., 2011; Martins et al., 2002). However, this outcome could be explained based on the preconceived perception of statistics as a mathematically-related subject. A mathematical phobia is prevalent among students in Nigeria, and most prospective undergraduates try to avoid mathematics and any related issues while applying for higher education. Unfortunately, statistics are offered in science and non-science courses, forcing these students to adopt a particular attitude towards the subject.

Furthermore, the result indicates that academic self-efficacy positively predicts attitude toward statistics. Thus, the result reflects students' ability to confront and handle perceived complex tasks more straightforwardly and the inability to solve personal academic tasks as a variable contributing to attitude towards statistics. Accordingly, Hayat

et al. (2020) noted that self-efficacy is one of the most critical factors in students' academic success. Thus, it is presumed that efficacy belief is a valuable factor in students' statistics attitude.

Conclusion:-

The present study established a statistically significant interaction between gender, academic self-efficacy, and attitude towards statistics in tertiary institutions. Hence, it is concluded that the variation in students' attitudes towards statistics is explained based on gender and academic self-efficacy. The study contributes to the statistics literature by revealing gender and academic self-efficacy as an essential determinant of attitude in relation to statistics. Although, the study encountered specific limitation that needs to be stated. For instance, the sample size was small and may not be dependable for generalization. Also, the design of the study did not allow for cause-effect determination. Future researchers should include more representative samples and adopt pure experimentation to ascertain cause-effect relationships. However, it is recommended that teachers, counselors, parents, and other relevant education stakeholders note the effect of gender and academic self-efficacy on attitude towards statistics in their role responsibilities.

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