Centralized Secondary School Examination, Basic Education Certificate Examination and Mathematics Test Anxiety As Predictors of Students' Achievement in Mathematics

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The purpose of the study was to investigate centralized secondary school examination (CSSE), basic education certificate examination (BECE) and mathematics test anxiety as predictors of students' achievement in mathematics. Two research questions and two hypotheses guided the study. Expo-facto research design was adopted for the study. The population of the study comprised all the students who took Senior Secondary Certificate Examination (SSCE) in 2017/2018 academic session in Imo state. The sample of this study comprised of 850students who took SSCE drawn through multi-stage sampling technique. CSSE 2017 result sheet, BECE 2016 result sheet, SSCE 2018 result sheet and mathematics test anxiety questionnaire (MTA) was used to collect data. The data collected were analyzed using multiple regression analysis. Results of the study revealed that CSSE, BECE and mathematics test anxiety had both composite and relative influence on students' achievement in mathematics. It was recommended that CSSE should be taken as a core component of the assessment process in mathematics at the SSII level as it prepares the students to face public examination situation, also BECE should be maintained in JSSIII third term by junior school board and avoid examination malpractice capable of destroying it. It was also recommended that students should be exposed to anxiety reduction activities like relaxation, exercises, debate, inter and intra class quiz competitions.

Keywords:[1]
Mathematics, test anxiety, predictor, students' achievement, examination

INTRODUCTION

The development of the Nigerian nation cannot be achieved without due attention on science and technology. Basic discipline in the sciences must reasonably be encouraged. In doing this, attention must be given to mathematics which is the bed rock of all sciences. Mathematics is a tool of basic sciences, such as physics, chemistry, biology, and even social sciences such as geography, economics, banking, and finance. The role of mathematics in physical and agricultural sciences, engineering, aircraft, computer, textile, industries, and weather forecasting are numerous. It is therefore very difficult to imagine a world without mathematics. Mathematics as a subject is relevant virtually in everyday activities of man. Both the educated and non-educated are faced with mathematics issues and manipulations as they run daily life activities. Supporting this view, Usman and Ojo (2014) posited that the usefulness of mathematics extends to other fields of human endeavor such as politics, stock market, finance, and sports. This may be one of the reasons the managers of the Nigerian education system placed mathematics as one of the core subjects for students both in primary school (lower basic education), junior secondary (upper basic education) and the senior secondary education (post basic education). Credit pass in Mathematics is also one of the requirements for admission into many courses in Nigerian higher educational institutions.

The national policy on education (FGN, 2013) defined basic education as that education that comprises 6 years of primary education and 3 years of junior secondary school education. The education is designed to run for 9 years, within these 9 years, the child is exposed to several subjects, the core subjects, the electives and the vocational or trade subjects. At the end of the 9-year education program, the students are assessed through the Basic Education Certificate Examination (BECE). The examination replaced the formal, Junior Secondary Certificate Examination (JSCE). BECE is conducted in individual states of the federation including the federal capital territory (Ojenride, 2011). The aim of this education is to inculcate relevant skills necessary for self-reliance, employment, or further studies in the senior secondary school.

The senior secondary school runs for the next three years after junior secondary school. The senior secondary school curriculum comprises 3 years education in which students are exposed to variety of compulsory and elective subjects. The overall aim of senior secondary education is to prepare students for useful living within the society (FGN, 2013). At the end of senior secondary school, the students take an external examination called

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Senior Secondary Certificate Examination (SSCE). One of the core subjects students take in SSCE is mathematics.

Students who performed well in BECE are expected to also perform well in SSCE by West African Examination Council (WAEC), National Examination Council (NECO) or National Business and Technical Examination Board (NABTEB) public examinations. A few studies have shown positive relationship between BECE and SSCE examinations (Ifemuyinina, 2004, Adeymi, 2008, Orubu 2015) while Achimugu (2017) reported no relationship. School achievement is indexed by means of examinations. A child who passes school base assessments is expected to pass external or public examination prepared by the NECO, WAEC, and NABTEB. To this end, school administrators design several ways to prepare the students for these external examinations. The Imo state government being abreast of this introduced the centralized secondary school examination (CSSE) in 2006 as an internal mechanism for assessing students' preparedness for end of the course external examinations. The basic aim of introducing this examination is to assess the quality of students to be presented for public examinations (Imo state ministry of education, 2016). To this end, the CSSE examination is presented to students at the third term of senior secondary. Those that pass the examination are promoted to senior secondary school 3 and are deemed fit for the public end of school examinations by WAEC, NECO or NABTEB. Mathematics is a subject that many students are very much afraid of, the feeling of fear, phobia or anxiety that greets mathematics appears not to be so with other school subjects. Students call it the almighty mathematics. Maloney (2012) posited that many students experiences mathematics test anxiety and as a result avoid mathematics and mathematics related profession, severing limiting their future career and earning opportunities. Mathematics test anxiety is a feeling of tension and apprehension that interferes with application of numbers and solving of mathematical problems in a wide variety of ordinary and academic situation (Eniayeyu&Azuka, 2010). Generally, test anxiety causes poor performance in cognitive test (Olatoye, 2007) and mathematics is not an exception. Madu and Ebere (2016) investigated on the predictive validity of students' scores in mock senior school certificate examination on their scores in NECO external senior school certificate examination in 2010/2011 to 2013/2014 academic sessions in Umuohia Education Zone of Abia state and found out that the students mock senior school certificate examination scores significantly predicted their scores in senior school certificate examination scores. In similar studies by Obioma and Salau (2007), Oniha (2017), Ale (2008), and Okoi (2015) it was equally discovered that mock examination results significantly relate with academic achievement of students in mathematics. Oknu and Orum (2013) conducted a study titled Junior secondary school certificate examination (JSCE) results as predictors of students' performance in mathematics in senior secondary school certificate examination in Benue state and discovered that JSCE significantly predicted SSCE. Ugwuola and Abonyi (2014) carried out a study to determine the predictive validity of NECO junior secondary school certificate examination on student's performance in NECO senior certificate examination and it was found that NECO JSCE predicted NECO SSCE. In similar studies by Adeyemi (2006); Opera, Ijeoma and Uchechi (2017); Vein, Edokpayi and Suleiman (2011) it was equally discovered that JSCE predicts SSCE.

Chukwu (2014) carried out a study on the relationship between mathematics test anxiety, academic achievements, and interest of senior secondary school students in Enugu state and found that mathematics test anxiety significantly relates with academic achievement of students in geometry. In similar studies by Ogbu (2007); James (2014), Sieber (2015) and Okoi (2015) equally discovers that mathematics test anxiety significantly relates with academic achievement of students in mathematics. Literature seems to support that mathematics test anxiety influence academic achievement and CSSE examinations significantly predict academic achievement at all levels and BECE also predicts academic achievement of students. The composite influence of these variables on students' achievement in mathematics seems not to have been emphasized and this formed the basis of the curiosity of this present research. This study sought to ascertain how the combination of CSSE, BECE and Mathematics test anxiety predicts of students' achievement in mathematics.

Research Questions

What is the nature of regression equation for predicting student's achievement scores in mathematics using CSSE, BECE and mathematics test anxiety scores as predictors?

What proportion of variance in academic achievement score accounted for by predictor variables?

Hypothesis: CSSE, BECE and Mathematics test anxiety scores do not significantly predict achievement scores in Mathematics.

METHOD

The ex-post facto design was used in this study. This design is justified because the event under investigation has already taken place.

Study Group

The population for this study comprised all students who took SSCE in 2017/2018 academic session in Imo state. A sample of 850 students was selected using multi-stage random sampling method from eight schools out of 33,074 students in Imo state. The first level of sampling was education zone, second level was local government and third level was school. Simple random sampling technique was used to select four educational zones from six education zones in the state, twolocal governments were selected from each of the sampled education zones. Through random sampling technique one secondary school each was selected from each of the local government sampled for the study which yielded 8 secondary schools. The researcher therefore decided to use all the SS3 students in each sampled school.

Data collection

The data were collected by the researchers and some research assistants. Four instruments were used for this study named mathematics test anxiety (MTA) questionnaire, CSSE 2017 result sheet, BECE 2016 result sheet and SSCE 2012 result sheet on mathematics from which the student's scores were obtained. The MTA consist of 18 items on a likert type scale eliciting information on mathematics test anxiety. The mathematics test anxiety was trial tested for internal consistency using Cronbach Alpha reliability method. The estimate revealed the reliability coefficient of 0.71.

Data Analysis

The research questions 1 and 2 were answered using multiple regression analysis and model of summary of multiple regressions respectively. The hypothesis was answered using multiple regressions.

FINDINGS

Research Question 1: What is the nature of regression equation for predicting students achievement scores in mathematics using CSSE, BECE and mathematics test anxiety scores as predictors?

Table 1: Coefficient of CSSE, BECE and mathematics test anxiety scores on achievement scores in mathematics.

Variables	B	Std. Error	Beta	T	P-value
Constant	2.566	0.337		7.605	0.000
Maths test	-0.068	0.008	-0.219	-8.195	0.000
CSSE	0.051	0.004	0.438	12.376	0.000
BECE	0.027	0.004	0.218	6.021	0.000

Dependent Variable: SSCE

Data in table 1 shows that, the nature of regression equation is

ACC = 2.566 - 0.069 MTA + 0.051CSSE + 0.027 BECE.

The equation shows that for every unit increase in the coefficient of CSSE, achievement in CSSE increase by 0.051. For every unit increase in the coefficient of mathematics test anxiety, achievement in mathematics increase by 0.068 and for every unit increase in the coefficient of BECE, achievement in BECE increase by 0.027.

Research Question 2: What proportion of variance in academic achievement accounted for by predictor variables?

Table 2: Model summary of adjusted R^2 on proportion of variance in mathematics achievement score accounted for by the predictor variable

Model	R	R^2	Adjusted R^2	Std error of estimate	R^2 change	F-change	P-value
1	0.762	0.581	0.580	1.122	0.581	391.237	0.000

Predictors: CSSE, BECE and Mathematics test anxiety

Table 2 shows that, the multiple correlation index of the predictor variables of centralized secondary school examination, Basic Education Certificate Examination and mathematics test anxiety is 0.58.

Hypothesis: Centralized secondary school examination, Basic education certificate examination and mathematics test anxiety do not significantly predict achievement scores in mathematics.

Table 3: Summary of composite effect of centralized secondary school examination and mathematics test anxiety on SSCE

Model	Sun of squares	Df	Mean square	F	P-value
Regression	1477.621	3	492.540	391.237	0.000
Residual	1065.056	846	1.259		
Total	2542.678	849			

Table 3 shows a regression and residual sum of square on centralized secondary school examination (CSSE), Basic education certificate examination (BECE) and mathematics test anxiety as 1477.62 and 1065.056 respectively. The obtained $F_{(3,846)}$ = 391.237. The associated probability value (0.000) with computed F value (391.237) was less than the 0.05 level of significance, the null hypothesis was rejected. It implies that CSSE, BECE and mathematics test anxiety scores significantly predict students achievements scores in mathematics.

Discussion, Conclusion and Recommendations

As can be seen from the results of the study, CSSE, BECE and mathematics test anxiety had both composit and relative influence on student's achievement in mathematics. CSSE, BECE and mathematics test anxiety had a strong relationship with mathematics performance of senior secondary school three students. The 76.2% of the total contribution considered strong. Residual which could have accounted for remaining 23.8%. this findings corroborate other studies (Ifemunia, 2004; Adeyemi, 2008; Orubu, 2015). In this context, we can say that the result of the study had similarities with the existing literature. In addition, it is known that CSSE and BECE significantly predicts mathematics performance of students (Ale, 2008; Demirbağ, 2020; Duman & Karagöz,2016;Eyong, Ugada & Aminu, 2020; Hariyani, Ahmad &Marsitin,2021; Madu & Ebere, 2016; Obioma & Salau, 2007; Okwu & Orum, 2013; Oniha 2017; Ugwuola & Abongi, 2014). It was discovered in this result that the possible contribution of CSSE and BECE contributing significantly in a positive way to the prediction of mathematics performance is that CSSE and BECE in mathematics prepare students for future mathematics challenges. In our present time students take mock examination very serious. Hence, the more students engage in mock examination, the more effective they become in their examination. Conversely, students who are not serious in their mock examination would not perform high during their final mathematic examination.

It was also discovered in the results that mathematics test anxiety had an inverse significantly influence on mathematics performance of senior secondary school students. This findings corroborate other studies (Arslan, 2017; Chukwu 2014; James 2014; Karagöz & Rüzgar,2020; Sierber 2015; Ogbu 2007). The possible explanation of mathematics test anxiety contributing significantly to the prediction of mathematics performance of senior secondary school three is that most students are not aware that personality characteristics such as mathematics test anxiety can affect their mathematics performance. Hence, the more students are aware about these personality characteristics as variable that can predict their mathematics performance, the more effective they become in writing mathematics examination. The combination of CSSE, BECE and mathematics test anxiety predicted significantly the mathematics performance of senior secondary school three students. The result of this study has shown that, the combination of CSSE, BECE and mathematics test anxiety predicts

student's achievement in mathematics with mathematics test anxiety haven the highest predictive power. In view of the findings, CSSE should be taken as a core component of the assessment process in mathematics at the secondary school two level, as it serves as a means of promoting students into senior secondary school three and as it prepares the student to face examination situation before the certificate examination, also BECE should be maintained in JSSIII third term by junior school board and avoid examination malpractice capable of destroying it. Individual schools can organize anxiety reduction activities for students. This they can do by involving the students in relaxation exercise, jogging and training them on how to be thinking about calm and comfortable experiences. Teachers can also counsel students about the important of mathematics, on one hand, and the possibility of passing mathematics examinations with ease on the other hand.

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