PREDICTING ACHIEVEMENT IN MATHEMATICS: A CORRELATIONAL STUDY OF SELF-ESTEEM AMONG PUPILS IN ENUGU STATE, NIGERIA

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Abstract

The situation orchestrated by a dismal achievement of pupils and students in mathematics has been on the front burner in education discussions. The situation is more disturbing as one notices that these children drop out of school and take to doing drugs and crimes due to low self-esteem and inferiority complexes. One, therefore, wonders if there exists any correlation between self-esteem and pupils' academic success. This study investigated the association that existed between two important variables in academics (Self-esteem and Achievement). A correlational survey research design was utilized in the investigation. All the 42,723 primary five pupils in Enugu State formed the population with a sample size of 685 pupils drawn through a multi-stage sampling technique. The instruments for data collection were PSEQ and PMAP. Both instruments were validated by three experts and the internal consistency reliability coefficient was estimated to be 0.75 using Cronbach Alpha method. The data collected were analyzed utilizing Pearson's Product Moment Correlation Coefficient, as well as the coefficient of determination (r2). The results of the study revealed that self-esteem has a positive significant influence on pupils' achievement in mathematics and that gender and location have no moderating effects on the predictive power of self-esteem on the academic achievement of pupils in mathematics. Therefore, it was recommended among others that teachers should inculcate positive self-image in the pupils and that a self-esteem enhancement programme should be put in place for pupils to help the children make positive evaluations of their personalities.

Keywords: Self-esteem, Pupils, Achievement, Correlational, and Mathematics.

Introduction

Education is a veritable apparatus utilized by man for personal as well as societal development. Education is a process that refines the sensibilities of man for national cohesion, consciousness and harmony, and general development among others. Education is an instrument created to promote national unity and development, empowering man to advance in politics, economics and cultural development (Makondo and Makondo, 2020). Similarly, Li and Sun (2021) pointed out that through education, enormous progress has been achieved in the areas of science and technology. Globalization has stunned geographical frontiers expanding man's horizon, nations therefore, strive to keep pace with other nations through science and technological development. Different countries of the world are steadily working hard to achieve a higher standard of living, industrialize and catch up with the developed nations in terms of growth in technology (2015). To achieve this, mathematics seems to be an essential variable. Hence, Sa'ad et al. (2014), Nyathi (2020) and Chand et al. (2021) opined mathematics education remains a foundation and a crucial vehicle that drives science and technological progression of the current world order. Indeed, mathematics is an indispensable protagonist in man's life since it is involved in all facets of human endeavour. This coincides with the view of Okenyi et al. (2021) who hypothesized that Mathematics offers an operative means of developing a strong mental discipline with its concomitant rational intelligence, thereby preparing the individual for a meaningful life in the society. Subsequently, various

countries include mathematics among the compulsory subjects at all levels of education, as it is a vital subject for social as well as individual growth and development.

The Federal Republic of Education (FRN, 2014) classified mathematics among the subjects one must obtain a credit pass to qualify to be admitted into institutions of higher learning in Nigeria. The implication of this is that mathematics is vital to the academic success of learners as well as to the development of the country. Mathematics is the mother of other subjects since it aids in the mastery of every other school subject (Okenyi et al. 2021). Nevertheless, even though mathematics takes a pivotal stance in the school syllabus, it seems obvious that most learners find mathematics difficult and lack interest in the subject (Azmidar et al., 2017; Chand et al., 2021; Kihwele & Mkomwa, 2023). The pupils' colossal failure in Mathematics at the First School Leaving Certificate Examinations (FSLCE) is disturbing as well as worrisome. The Chief Examiner's Reports (2021; 2022; 2023) showed that pupils displayed a massive underperformance in Mathematics in 3 consecutive years in FSLCE which, was blamed on numerous variables including lack of interest and self-esteem on the part of the pupils. The reports bemoaned the undesirable effect of the state of affairs on the pupils' future careers in science disciplines and national development. and the dismal number of learners offering mathematics-related courses in the recent past is upsetting (Gana et al., 2019; Chand et al., 2021; Kihwele & Mkomwa, 2023). This situation could be orchestrated by low performance, poor motivation and little or no interest in the subject during the foundation level of education. Koruk (2017) pointed out that among other variables; self-esteem is a noon cognitive factor that plays a significant role in academic achievement.

Self-esteem refers to the conclusion arising from one's appraisal of one's internal stability and value. It is the feeling of a person's value of him or herself, such as I am commendable, I am intellectually viable, I can do it well or a perceived self-awareness (Mama et al. 2022). Self-esteem is the magnitude of value or worth a person ascribes to him or herself (Subon et al., 2020). Cherry (2022) conceptualized self-esteem as the total feeling of importance or the level of significance one places on him/herself. Self-esteem is an individual's capacity to handle various situations with comportment, the feeling of being laudable and being able to execute extraordinary tasks and achieve great feet (Stangor, 2022). Susman (2022) pointed out that self-esteem could be healthy or unhealthy, arguing that healthy self-esteem influences a person's enthusiasm, motivating the individual to achieve difficult tasks as well as experiencing a feeling of well-being, while unhealthy self-esteem influences an individual negatively leading to failure most often. Self-esteem is a concept of oneself, which does not mirror the individual's authentic qualities, nor represents others' perception or views of him/her (Orth et al., 2018). Self-esteem is therefore, a psychological construct that determines the magnitude of an individual's willpower, his behaviours as well as motivation, and confidence and controls how he elevates himself, his ideas and opinions. The implication of this is that healthy self-esteem may motivate the learner to develop interest and participate actively in the teaching-learning process, which may translate to better or higher achievement in mathematics and vice versa. On this note, Priyadharshini and Relton (2014) stated that Learners with healthy self-esteem seem to be assertive and trust their ability to succeed in difficult school subjects. Nevertheless, some researchers argue that some students with healthy self-esteem take active participation in the class and come out with low academic achievement and vice versa (Ballene, 2019).

In a study that examined the effects of self-esteem on the academic achievements of mathematics undergraduates in Eldoret West Sub-County, Kenya, Chonge and Achwang'a (2019) discovered that self-esteem significantly impacted the academic achievement of mathematics high school learners in Kenya. Furthermore, the authors concluded that learners with healthy or high self-esteem achieved more than the ones with low self-esteem. In a related but distinct study that correlated self-concept with achievement in mathematics and English

language among Kenyan high school learners, Sparks et al. (2015) discovered that students with high levels of self-concept achieved better in mathematics and English than those with low self-concept. However, Kariuki (2021) in a study that surveyed the relationship that existed between self-esteem and the academic success of Kenyan students based on gender found that there existed no relationship between self-esteem and academic success of students with regards to gender. This implies that self-esteem had no significant impact on the academic success and achievement of high school boys and girls in Kenya.

However, in another but related study that x-rayed the impact of self-esteem on the school performance of science students in Enugu State, Mamah et al. (2022) discovered that self-esteem had a significant effect on the success of science students. Furthermore, the authors also found out that gender and location had no moderating power over the predictive powers of self-esteem on the success of science learners in high school. Gender here refers to the biological make composition that influences the societal roles distinguishing males from females. It is a social characterization of men and women in different roles (WHO, 1998). Whereas location classifies the inhabited communities. School location is the physical and geographical area in which the school is established (Umar & Samuel, 2018).

In a related study that examined the effect of self-concept on students' mathematics learning achievement, Kunhertanti and Santosa (2018) found that no significant correlation existed between self-concept and undergraduate achievement in mathematics. In another study that x-rayed self-esteem and achievement goal orientation as a correlate of students' achievement in mathematics in Anambra state, Anyanwu and Emesi (2020) discovered that students' self-esteem had a low negative relationship with mathematics achievement of students. These prevailing discrepancies in the researchers' findings indicate that the degree and direction of the association between these variables (self-esteem and learners' academic success) is uncertain, inconclusive and ambiguous, needing further and more in-depth examination.

Obviously, the hypothesis suggesting that highly self-esteemed learners, who take active participation in the teaching-learning processes, are more interested in the class activities and subsequently achieve better academic success is contentious. This is because there are some learners with negative or low self-esteem, who do not participate actively in class work but have excelled educationally. Furthermore, learners differ in terms of other numerous variables, such as age, socioeconomic status, locality and sex. Yet studies have neither indicated explicitly how these variables relate to self-esteem to explain the disparities observed in learners' successes and failures nor the disparity in academic successes that can be predicated on self-esteem based on any of these variables. To this end, it is expedient to determine the magnitude of discrepancies in pupils' progress in mathematics that can be ascribed to self-esteem as moderated by sex and locality in Enugu State, Nigeria.

Purpose of the Study

The general purpose of the study was to ascertain the magnitude of pupils' academic success in mathematics that can be ascribed to self-esteem with gender and locality as moderating variables. Specifically, the study investigated:

1. the extent to which self-esteem can predict pupils' academic achievement in mathematics
2. the predictive power of self-esteem on pupils' achievement in mathematics based on gender.
3. the predictive power of self-esteem on pupils' achievement in mathematics based on location.

Research Questions

The researchers formulated three research questions that guided the study

1. What is self-esteem's predictive power on pupils' academic success in mathematics?
2. What is the predictive power of self-esteem on the academic success of pupils in mathematics based on gender?
3. What is the predictive power of self-esteem on the academic success of pupils in mathematics based on location?

Hypotheses

The following hypotheses, which were tested at a 0.05 level of significance, guided the study

1. Self-esteem has no significant predictive power on pupils' achievement in mathematics.
2. Self-esteem has no significant predictive power on the academic achievement of pupils in mathematics based on gender.
3. Self-esteem has no significant predictive power on the academic achievement of pupils in mathematics based on location.

Methods

Design of the study

The study adopted a correlational survey research design. Correlational survey research design is a research design that allows the researcher to investigate the strength, the magnitude of the direction of the association that exists between two or more phenomena without manipulating the situation (Nworgu, 2015). Correspondingly, Okenyi et al. (2019), Achagh et al. (2020), Ugwuanyi et al. (2020) and Okenyi et al. (2021) recently utilized this design in similar research works. This study was carried out in Enugu State of Nigeria. There are 17 local Government Education Authorities in the state, which include Aninri, Awgu, Enugu-East, Enugu-North, Enugu-South, Ezeagu, Igbo-Etiti, Igbo-Eze North, Igbo-Eze South, Isi-Uzo, Nkanu-East, Nkanu-West, Nsukka, Oji River, Udenu, and Udi Local Government Education Authorities (LGEAs).

Population of the Study

The population of the study comprised all the 42,723 primary five pupils in all the 1,223 public primary schools in Enugu State. They are 17,411 males and 25,312 females) primary five pupils in the 2021/2022 academic session (Source: Enugu State Universal Basic Education Board (ENSUBEB), Statistics Department, 2021).

Sample Size and Sampling Technique

A sample size of 185 pupils (75 males and 110 females) and primary five pupils were utilized in the study. A Multi-stage sampling technique was utilized in the study. In the first phase, a simple random sampling technique by balloting with replacement was used to sample seven (7) LGEAs (Enugu-East, Udenu, Nkanu-West, Oji River, Nsukka, Udi and Igbo-Eze North LGEAs). In the second phase, a proportionate stratified sampling procedure was utilized in sampling twenty (20) public primary schools from the seven LGEAs, thus; three (3) schools from Enugu-North LGEA; two (2) from Udenu; three (3) from Nkanu-West; two (2) from Oji River; three (3) from Nsukka, three (3) and four (4) schools from Udi and Igbo-North LGEAs correspondingly. In the third phase, proportionate stratified was also utilized in sampling 102 pupils from Enugu-East LGEA; 88 from Udenu; 100 from Nkanu-West; 90 from Oji River; 99 from Nsukka; 101 and 105 pupils were sampled from Udi and Igho-Eze North LGEAs correspondingly. In the fourth phase, proportionate stratified was once again utilized to select

273 male pupils thus; 41 male pupils from Enugu-East LGEA; 33 from Udenu; 39 from Nkanu-West; 36 from Oji River; 39 from Nsukka; 40 and 45 male pupils were sampled form Udi and Igbo-Eze North LGEAs accordingly. At this stage, 412 female pupils were sampled thus; 63 female Enugu-West LGEA; 53 from Udenu; 56 from Nkanu-West; 54 from Oji River; 57 from Nsukka; 60 and 69 female pupils were sampled from Udi and Igbo-Eze North LGEAs respectively. The third and fourth stages utilized a proportionate stratified sampling technique for the fact that the numerical strength of schools and pupils (boys and girls) in the seven LGEAs are not equal.

Instrument for Data Collection

Two sets of instruments were utilized for the collection of data (A structured questionnaire and Pupils' Mathematics Achievement Proforma). The questionnaire titled "Pupil's Self-Esteem Questionnaire" (PSEQ) is a 15-item questionnaire on self-esteem, which was adapted from Rosenberg (1965) and modelled on a four-point rating scales that ranged from Strongly Agree (4points), Agree (3points), Disagree (2points) and Strongly Disagree (1point). The Pupils' Mathematics Achievement Proforma (PMAP) designed by the researchers was utilized in collecting the first, second and third-term results of the pupils that were sampled.

Validation of the Instruments

The instruments PSEQ and PMAP were face-validated by three experts from the Department of Educational Foundations, Enugu State University of Science and Technology, Enugu. These experts appraised the instruments in relation to their language simplicity, items' precision and significance to the study. The feedback and recommendations of the experts were considered in the instruments' final modification.

Reliability of the Instruments

The PSEQ was administered to 30 primary five pupils in three primary schools; one in Enugu-North; one in Igbo-Etiti; and one in Awgu LGEAs, which were not parts of the sampled LGEAs. The instrument's internal consistency yielded a reliability coefficient of 0.78 using the Cronbach Alpha reliability method.

Data Analysis

The data collected were analyzed utilizing using simple linear regression. A correlation coefficient value below 0.30 was assumed low coefficient, 0.30 to 0.80 was a moderate coefficient while from 0.80 and above were assumed to be high. Hypotheses 1 was tested using a regression t-test, while Hypotheses 2 and 3 were tested using a t-test of the significance of correlation coefficients. All the null hypotheses were tested at a 0.05 level of significance.

Results

The results of the research were presented in line with the study's research questions and hypotheses.

Table 1: Regression analysis of the predictive power of self-esteem on achievement of pupils in mathematics

Model	R	R Square	Adjusted R Square	t	P
1	.770[a]	.592	.590	16.309	.000

a. Predictors: (Constant), Self-esteem

Table 1 shows that the predictive power of self-esteem on achievement of pupils in mathematics is 59.2% (R^2 = .592). It was further found that there is a significant predictive power of self-esteem on the achievement of pupils in mathematics, t = 16.309, p = .000. Thus, the null hypothesis was rejected since the p-value of .000 is less than the 0.05 level of significance.

Table 2: Regression analysis of the predictive power of self-esteem on achievement of pupils in mathematics based on gender

Model	Gender	n	R	R Square	T	P
1	Male	75	.734[a]	.539	1.521	.128
	Female	110	.824[a]	.678		

Table 2 indicates that the predictive power of self-esteem on achievement of male pupils in mathematics is 53.9% (R^2 = .539) while that of the female pupils is 82.4% (R^2 = .824). However, further analysis revealed that there is no significant moderating influence of gender on the predictive power of self-esteem on the achievement of pupils in mathematics, t = -1.521, p = .128. Hence, the null hypothesis was not rejected ($p > .05$)

Table 3: Regression analysis of the predictive power of self-esteem on achievement of pupils in mathematics based on location

Model	Location	n	R	R Square	T	p
1	Urban	105	.866[a]	.750	3.899	.000
	Rural	80	.622[a]	.387		

Table 3 indicates that the predictive power of self-esteem on achievement of urban school pupils in mathematics is 75%% (R^2 = .750) while that of the rural school pupils is 38.7% (R^2 = .387). Thus, further analysis revealed that there is a significant moderating influence of location on the predictive power of self-esteem on the achievement of pupils in mathematics, t = 3.899, p = .000. Therefore, the null hypothesis was rejected ($p < .05$)

Discussion

The findings of the study revealed that there exists a high and positive correlation between self-esteem and pupils' academic achievement in mathematics. In addition, a 59.2% variation in the pupils' achievement in mathematics is predicated on self-esteem. However, further analysis shows that self-esteem has a significant predictive power on the academic

achievement of pupils in mathematics and that gender and location have no significant predictive effect on pupils' achievement in mathematics. The findings of the study collaborated the findings of Kunhertanti and Santosa (2018), and Achwang'a (2019) who found that self-esteem has a positive and significant effect on secondary school students' achievement in mathematics. Again, the findings of the study validated the findings of Sparks et al. (2015), Mamah et al. (2022), and Kariuki (2021). Sparks et al. found out that students with high levels of positive self-concept achieved higher in mathematics and English language than their peers with negative and low self-concept. While Mamah et al., and Kariuki (2021) revealed that self-esteem has a significant effect on the success of science students and that gender and location had no moderating effect on the predictive powers of self-esteem on the success of science learners in high schools. The implication of this is that the more a pupil acquires self-esteem the more he/she achieves in mathematics. The pupil's gender (male or female) and location (urban or rural) notwithstanding. However, the findings of the study contradicted the findings of Kunhertanti and Santosa (2018) who found that self-esteem had no significant effect on the academic achievement of undergraduate students in mathematics.

Conclusion

Based on the study's findings, the researchers concluded that self-esteem impacted significantly on pupils' achievement in mathematics. Again, that gender and location are not significant variables to consider while determining pupils' academic achievement in mathematics.

Recommendations

Based on the outcome of the study, it is suggested that:

1. The teacher should inculcate the spirit of positive self-evaluation in the pupils, teaching the pupils that positive self-esteem is important for school success.
2. Schools and stakeholders should organise Self-esteem enhancement programmes for the pupils.
3. Parents should be educated on how to parent the children with the much needed love and support to boost the pupils' self-esteem, in other to work hard and achieve more in school.
4. The Ministry of Education should recruit professional and educational counsellors in the primary school to provide the pupils with proper and adequate guidance towards positive personality trait development.

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