

Prediction of learners' mathematics performance by their emotional intelligence, self-esteem and self-efficacy

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Abstract

In spite of the place of mathematics in the Nigerian education system, the performance of students in both external and internal examinations is on the downward trend. Research on factors affecting students' achievement in mathematics has often neglected the impact of psychological variables, such as emotional intelligence, self-esteem, and self-efficacy. This study, therefore, was designed to study how emotional intelligence, self-esteem and the self-efficacy of students predict their academic achievement in mathematics. The correlational survey research design was employed with a population of 2,937 senior secondary 2 students and a sample of 400 students sampled from 16 secondary schools in the Nnewi Education zone of Anambra State. Emotional intelligence, Self-esteem, Self-efficacy Questionnaires, and Students' Academic Achievement Score Form (SAASF) were used to collect data through the direct delivery method. Data were analyzed using simple linear regression analysis. The results showed that emotional intelligence, self-esteem, and self-efficacy had significant predictive powers on students' academic achievement in mathematics. Thus, emotional intelligence, self-esteem, and the self-efficacy of students are prime determinants of their achievement in mathematics. It was recommended that students should be taught using methods that will enhance their emotional intelligence, self-esteem, and self-efficacy.

Keywords: Emotional intelligence, Mathematics Achievement, Secondary school, Self-efficacy, Self-esteem.

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1. Introduction

Students' poor performance in mathematics examinations in Nigeria is a source of worry to mathematics educators and parents in general. For instance, in the years 2009 to 2012 and 2015, the percentage pass in mathematics with credit and above in Nigeria was 23.0% in 2009, 31.0% in 2010, 24.94% in 2011, and 38.98% in 2012, 38.68% in 2015 (Iyi, 2016). Efforts have been made by researchers in mathematics education to find solutions to the problem of the poor achievement of students in mathematics, but considerable success has not been achieved. Such efforts were mainly based on cognitive factors with little or no attention to psychological factors. The development of the cognitive domain of learning as a determinant of academic achievement and success in life has been the concern of formal education in Nigeria over the years (Osenwegwor, 2018).

Most education institutes pay much attention to the intelligent quotient level of learners than their Emotional Intelligence (Monica & Ramanaiah, 2019). In line with that, Azuka (2012) opined that other than cognitive factors, students' emotional intelligence also does influence their academic achievement in mathematics. Osenwegwor (2018), however, reported that researchers have begun to recognize that factors other than intellectual ability play important roles in the academic success of learners. Such factors include emotional intelligence, self-esteem, self-efficacy, etc. (Azuka, 2012; Osenwegwor, 2018; Koc, 2019; Monica & Ramanaiah, 2019).

1.1 Conceptual and theoretical Background

Emotional intelligence is a subcategory of social intelligence that enables a learner to control his or her emotions (Ranjbar, Khademi, & Areshtana, 2017). Emotional Intelligence (EI) includes important aspects of an individual's internal and external relationships that determine their academic achievement (Fallahzadeh, 2011). EI refers to the cognitive ability of the learners to consider and manage their emotions (Pool & Qualter, 2012). Emotional intelligence is the ability to perceive accurately, appraise, and express emotion to promote emotional and intellectual growth (Koc, 2019). Emotional intelligence is based on Goleman's (2006) theory of emotional intelligence.

Goleman stated that individuals are born with a general emotional intelligence that determines their potential for learning emotional competencies. Emotional intelligence theory links human academic achievement with the knowledge of emotional intelligence. According to Goleman (2006), emotional competencies are learned capabilities that must be worked on to achieve outstanding performance rather than being innate (Goleman, 2006). This theory suggests that a student with a high EI has greater academic achievement job performance and leadership skills. Thus, the researchers validated the theory by establishing the relationship between students' EI and their achievement in mathematics. Related to the students' emotional intelligence is their self-efficacy

Self-efficacy reflects the ability to exert control over one's motivation, behavior, and social environment (Bahmanabadi & Baluchzade, 2013). Self-efficacy refers to the beliefs about one's capabilities to learn or perform at designated levels (Bandura, 1997). Individual's behavior is determined by their beliefs about their abilities and the result of their efforts (Adeoyo & Feyisetan, 2015). Self-efficacy is crucial in the theoretical framework of Bandura's Social Cognitive Theory. SCT states that learning occurs in a social context and that much of what is learned is gained through observation (Bandura, 1977). Bandura's Social Learning Theory shows a direct correlation between a person's perceived self-efficacy and behavioral change which relates to self-esteem.

Self-esteem relates to someone's belief in personal success, purpose to be achieved, and personal performances based on his or her previous experience. Self-esteem is the individual's attitudes and views about the outside world (Carmen-Mihaela & Alina, 2013). In line with the above assertion, an

individual's self-esteem encompasses their personal success expectations and determination which results from their mental disposition (Carmen-Mihaela & Alina, 2013). Carmen-Mihaela and Alina believe that people with high self-esteem are able to reason properly and have better views about themselves. Yaratan and Yucesoylu (2010) opined that one's self-esteem is dependent on the treatments received by the family members, teachers, coaches, religious authorities, and peers. People of poor self-esteem believe that they are unsuccessful and unhelpful when they do not achieve their goals (Daglas, 2006).

Self-esteem is within the theoretical framework of identity theory by Sheldon Stryker (1980). According to Stryker (1980), identities are a major part of self and are seen as the internal conceptualization of the individual's position and designations in various social contexts. Self-esteem according to Stryker (1980) influences certain dependent variables like academic achievement, happiness, among others.

1.2 Review of Relevant Literature

Emotional intelligence is an important element of research and also the predictor of the well-being, health, and also the academic outcomes of the learners (Mudiono, 2019). Osenwegwor (2018) found that emotional intelligence relates positively to learners' academic achievement. Adeyemo and Adeleye (2008) found self-efficacy relates positively with emotional intelligence. Emotional intelligence skills had a significant influence on the locus of control and self-efficacy of learners in Nigeria (Umaru & Umma, 2015). Ranjbar, Khademi, and Areshtanab (2017) found a low relationship between emotional intelligence and educational achievement of Iranian students. Aghazade, Sharmin and Moheb (2017) found that self-efficacy of learners in school activities had a significant relationship with emotional intelligence. Azuka (2012) found that the achievement of learners in mathematics had a significant positive relationship with emotional intelligence. Monica and Ramanaiah (2019) found that there is a significant positive relationship between emotional intelligence and self-efficacy.

Korkmaz, İlhan, and Bardakci (2018) found that the relationship between academic achievement and self-efficacy as well as the locus of control was insignificant. Oyelekan, Jolayemi, and Upahi (2018) found that learners' achievement in chemistry had a significant positive relationship with their self-efficacy. Njega, Njoka and Ndung'u (2019) found that self-efficacy has a strong positive relationship with learners' performance. Self-efficacy according to El-Adl and Alkharusi (2020) had a statistically positive relationship with learners' academic achievement. Adeoye and Feyisetan (2015) found that learners' academic achievement in the English language was determined by their self-efficacy. Similar studies found that learners' academic achievement had a significant positive relationship with their self-efficacy (Bushra & Lubna 2014; Hammed & Toyin 2015; Osenwegwor 2018; Hüseyin, Yıldız & Mehmet 2018; Oyuga, Raburu & Aloka 2019; Nwaukwa, Onyemechara & Ndubuisi 2019).

Adeoye and Feyisetan (2015) found that self-esteem significantly contributed to academic achievement learners. Asakereh and Yousofi (2018) found that self-esteem had a significant relationship with the academic achievement of Iranian students. Self-esteem has a low relationship with academic achievement (Hadinezhad & Masoudzadeh, 2018). However, self-esteem does not significantly affect academic performance (Sepahi, Niroumand, Keshavarzi & Ahmade 2015).

1.3 Problem Statement and Objectives

The studies reviewed thus far have shown that there are a lot of inconsistent findings on the relationship between emotional intelligence, self-efficacy and self-esteem, and students' achievement in mathematics. Most of such studies were limited to the nature and magnitude of such a relationship,

using Pearson's product-moment correlation coefficient rather than regression analysis. Besides, most of them are foreign literature. These gaps in literature within the Nigerian context necessitated the current study. The study sought to determine the amount of variation in learners' achievement in mathematics that can be attributed to their emotional intelligence, self-esteem, and self-efficacy.

1.4 Hypotheses

The following null hypotheses were tested at 5% probability levels.

Ho₁: The amount of variation in learners' achievement in mathematics as result of their emotional intelligence is not significant.

Ho₂: The amount of variation in learners' achievement in mathematics as result of their self-efficacy is not significant.

Ho₃: The amount of variation in learners' achievement in mathematics as result of their self-esteem is not significant.

2. Methods

2.1 Research paradigm and approach

This research is based on the assumptions of emotional intelligence theory by Goleman, Bandura's Social cognitive theory, and identity theory by Sheldon Stryker. Goleman believed that individuals are born with a general emotional intelligence that determines their potential for learning emotional competencies. This research adopted a pure quantitative research methodology. Quantitative methods deal with numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data using computational techniques (Creswell, 2014).

2.2 Research Design

This study adopted a correlational survey research design that indicates the direction, magnitude, and strength of the relationship between the variables.

2.3 Population, sample size, and sampling

The population for this study was 2,937 senior secondary 2 learners in all the government secondary schools in the Nnewi education zones of Anambra State Nigeria. A sample of 400 senior secondary 2 learners out of the population was used for the study. This sample size was determined by the use of Taro Yamane's (1973) statistical formula for the determination of sample size. The multi-stage sampling procedure was adopted in composing the sample. In the first stage, 3 Local Government Areas in the Nnewi Education zone were sampled out of the 4 Local Government Areas, using a simple random sampling technique. This was used to give each Local government area an equal chance of being sampled for the study.

In the second stage, 16 secondary schools were sampled from the 3 Local Government Areas in the zone, using a purposive sampling technique. In the third stage, the proportionate stratified random sampling method was used to sample the students from the sampled 16 schools, making a total of 400 senior secondary 2 students.

2.4 Instrumentation

Four instruments were employed for this study, namely; Emotional Intelligence Inventory (EII), Self-Esteem Scale (SES), General Self-Efficacy Scale (GSES), and Students' Academic Achievement Score Form (SAASF). Farn-Shing, Ying-Ming, Ching-Yua, and Chia-An's (2007) emotional intelligence Inventory was adapted for the study. The Emotional intelligence inventory has the response patterns; Never true, Seldom true, sometimes true, often true, always true. In this study, the researchers used response patterns; strongly agreed, agreed, disagreed, strongly disagreed.

2.6 Ethical measures

To conduct this study, the researchers sought ethical clearance from the Research Ethical Committee of the Faculty of Education, University of Nigeria. Thus, the study was granted ethical approval with ID No: REC/FE/27/0024. The researchers strictly followed the ethical standard specifications of the American Psychological Association (APA, 2017).

2.7 Data analyses

Coefficient of determination, which is an aspect of linear regression, was used to answer the research questions, while analysis of variance (ANOVA) was used to test the null hypotheses at 5 percent probability level. These parametric statistics were used due to the assumption that the students are of populations of equal variance.

3. Results

Ho₁: The amount of variation in learners' achievement in mathematics as result of their emotional intelligence is not significant.

Table 1: Regression and Analysis of variance of the relationship between learners' achievement in mathematics and their emotional intelligence

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	
1	.503 ^a	.253	.251	10.03978	
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	13582.127	1	13582.127	134.747	.000 ^b
1 Residual	40117.311	398	100.797		
Total	53699.437	399			

a. Dependent Variable: Student Academic Achievement in maths

b. Predictors: (Constant), STUDENT EMOTIONAL INTELLIGENCE

Table 1 showed that the coefficient of determination for the relationship between emotional intelligence and learners' achievement is 0.253 meaning that 25.3% variation in learners' achievement is due to their emotional intelligence. Table 1 also showed that the amount of variation in learners' achievement in mathematics due to their emotional intelligence is significant, $F(1, 398) = 134.747$, $p < .050$. The null hypothesis was rejected at $p < .05$. The inference drawn was that the learners' emotional intelligence significantly predicts their achievement in mathematics.

Ho₂: The amount of variation in learners' achievement in mathematics as result of their self-esteem is not significant.

Table 2: Regression and Analysis of variance of the relationship between learners' achievement in mathematics and their self-esteem

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	
1	.525 ^a	.275	.273	9.88900	
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	14778.084	1	14778.084	151.117	.000 ^b
1 Residual	38921.354	398	97.792		
Total	53699.437	399			

a. Dependent Variable: Student Academic Achievement in maths

b. Predictors: (Constant), STUDENT SELF ESTEEM

Table 2 showed that the coefficient of determination for the relationship between self-esteem and learners' achievement is 0.275 meaning that 27.5% variation in learners' achievement is due to their self-esteem. Table 2 also showed that the amount of variation in learners' achievement in mathematics as a result of their self-esteem is significant, $F(1, 398) = 151.117, p < .050$. The null hypothesis was rejected at $p < .05$. The inference drawn was that learners' self-esteem significantly predicts their achievement in mathematics.

H₀₃: The amount of variation in learners' academic achievement in mathematics as result of their self-efficacy is not significant.

Table 3: Regression and Analysis of variance of the relationship between learners' achievement in mathematics and their self-efficacy

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	
1	.597 ^a	.356	.355	9.31948	
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	19132.045	1	19132.045	220.281	.000 ^b
1 Residual	34567.392	398	86.853		
Total	53699.437	399			

a. Dependent Variable: Student Academic Achievement in maths

b. Predictors: (Constant), STUDENT SELF EFFICACY

Table 3 showed that the coefficient of determination for the relationship between self-efficacy and learners' achievement is 0.356 meaning that 35.6% variation in learners' achievement is due to their self-efficacy. Table 3 also showed that the amount of variation in learners' achievement in mathematics due to their self-efficacy is significant, $F(1, 398) = 220.281, p < .050$. The null hypothesis was rejected at $p < .05$. The inference drawn was that the learners' self-efficacy significantly predicts their achievement in mathematics.

4. Discussion and Conclusion

The study sought to find out how learners' emotional intelligence, self-efficacy, and self-esteem relate to their achievement in mathematics. The findings of the study revealed that that three psychological variables (emotional intelligence, self-efficacy, and self-esteem) relate positively to learners' achievement in mathematics. Thus, emotional intelligence, self-efficacy, and self-esteem significantly predict learners' academic achievement in mathematics. These findings are not far from reality in that several studies have found that emotional intelligence, self-efficacy, and self-esteem are prime determinants of students' academic achievement in different subjects. These findings are in agreement with the findings of the recent studies (Mudiono 2019; Osenweugwor 2018; Ranjbar,

Khademi & Areshtanab 2017; Aghazade, Sharmin & Moheb 2017; Monica & Ramanaiah 2019; Korkmaz, Ilhan & Bardakci 2018; Njega, Njoka & Ndung'u 2019; Oyelekan, Jolayemi, & Upahi 2018; Asakereh & Yousofi 2018; Hadinezhad & Masoudzadeh 2018; El-Adl & Alkharusi 2020)

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These findings have some educational implications. For instance, to improve the academic achievement of learners in mathematics, measures that improve student emotional intelligence factors should be put in place, both at home and in school. Also, using appropriate instructional strategies that encourage self-esteem among the students by the teachers will translate to enhanced academic achievement. Enhancing students' self-esteem through the adoption of best practices in teaching will result in the improved academic achievement of the students. Finally, making students believe in their ability to succeed in a specific situation or accomplish a task will increase their self-efficacy, which, in turn, will lead to enhanced academic achievement.

4.1 Limitations

As correlational survey research, the generalizability of the findings of this study may be limited by some other factors not studied, such as gender, location, the cultural inclination of the participants, etc. In

other words, the influence of those factors may have played into the findings of this study, thereby limiting their generalizability to the entire population.

4.2 Recommendations

1. Parents and teachers should put measures in place at home and in school, respectively, that could improve learners' emotional intelligence, self-esteem, and self-efficacy.
2. Appropriate instructional strategies that encourage self-esteem among the learners should be used by the teachers to enhance the academic achievement of students in mathematics.
3. Teachers and school authorities, in general, should make students believe in their ability to succeed in a specific situation or in accomplishing a task.

4.3 Acknowledgment

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