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Emotional Intelligence as a Predictor of Secondary School Students' Academic Achievement in Mathematics in Onitsha Education Zone

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ABSTRACT

The study investigated emotional intelligence as a predictor of secondary school students' achievement in mathematics in Onitsha Education Zone. Two research questions guided the study and two hypotheses were tested at 0.05 level of significance. Correlation survey design was adopted for the study. The population of the study was 6, 382 senior secondary year two (SS2) students offering mathematics in Onitsha Education Zone of Anambra state. A sample of 600 students was involved in the study. The instruments for data collection were Emotional Intelligence Scale (EIQ) validated by three experts from Nnamdi Azikiwe University, Awka. The reliability of the instruments were established using Cronbach Alpha to be 0.83. The data obtained were analyzed using simple and multiple linear regressions. The findings of the study revealed that 0.2% of the variance in achievement in mathematics was predicted by emotional intelligence of students. Also, achievement scores in mathematics were significantly predicted by emotional intelligence. It was recommended that school guidance and counsellors should organise seminars and orientation exercise to acquaint students of the important of emotional intelligence in the learning of mathematics.

KEYWORDS: *emotional intelligence, achievement, mathematics, predictors*

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INTRODUCTION

The study of mathematics provides an effective way of building mental discipline and encourages logical reasoning and mental rigor. Mathematical knowledge plays a crucial role in understanding the contents of other school subjects such as science, social studies, and even music and art. It makes our life orderly and prevents chaos certain qualities that are nurtured by mathematics are power of reasoning, creativity, abstract or spatial thinking, critical thinking, problem-solving ability and even effective communication skills. A cook, a farmer, a carpenter or a mechanic, a shopkeeper or a doctor, an engineer or a scientist, a musician or a magician, everyone needs mathematics in their day-to-day life to be effective. Even insects use mathematics in their everyday life for existence. Snails make their shells, spiders design their webs, and bees build hexagonal combs. There are countless examples of mathematical patterns in nature's fabric. Thus, mathematics is an indispensable subject with its importance unanimously acknowledge among educators.

The importance of mathematics notwithstanding, students' performance in the subject has not been completely satisfactory. The unsatisfactory performances of the students in external examinations have been evident in the WAEC Chief Examiner's Reports. In 2015 and 2016, 38.68 percent and 52.97 percent of the students respectively enrolled for West African Senior School Certificate Examination (WASSCE) passed Mathematics at credit level while in 2017, 59.22 percent of the students passed Mathematics. 49.98 percent of the students representing 786,016 passed at credit level in 2018 showing that there was a significant decrease in the percentage number of students who passed Mathematics. In 2019, there was a significant increase in the number of students who passed Mathematics as 64.18 percent representing 1, 020,

519 students passed at a credit. There was a very poor performance by 2020 when 24,491 candidates representing 39.82 percent passed Mathematics at a credit level and above. 1, 274,784 candidates, representing 81.7%, obtained credits and above in 2021 showing a very significant increase in performance. A lot of factors have been adduced for the fluctuating achievement of students in Mathematics in external examinations among which the teaching methods adopted by mathematics teachers hold common place. However, little is known about how students' emotions or level of emotional intelligence interfere with their mathematics learning achievement.

Emotional intelligence is a multi-dimensional construct that influences a student's ability to succeed in coping with academic and environmental demands and pressures (Fiori & Vesely-Maillefer, 2019). Emotional intelligence (EI) according to Salovey and Mayer (2004) refers to the ability of being able to monitor one's own and other's feeling and emotions, to discriminate among them and to use this information to guide one's thinking and actions. It differs from cognitive intelligence and can change throughout life and can be improved through training. Positive emotional intelligence according to Ebrahimi, Khoshsima and Zare-Behtash (2018) is essential for personal accomplishment. The emotions, feelings, and values are vital for a person's wellbeing and achievement in life. Quality emotions and feelings help students to give their best potentials in the classroom.

The emotional intelligent student is skilled in four areas: identifying or perceiving emotions, understanding or facilitating thoughts, using and regulating emotions (Salovey & Mayer, 1993). To be success in learning any subject including mathematics, students should be able to read and identify the teachers and students' emotions from who they learn. Identifying such emotions as happiness and readiness to teacher could dispose students to learn from their peers at their best moods. The understanding gained from emotional identification Bhullar and Schutte (2019) could give students thought about how to go about any academic challenges especially those that are negative in nature. To overcome such emotional challenges, students should have the ability to regulate emotions.

Studies have also shown that emotional intelligence just like intelligence quotient could predict achievement in various subject areas. Saloma, Noor, Nor, Gladys, Muhammad, and Nur, (2014) in a study on relationship between emotional intelligence and academic achievement of secondary school students in Sarawak and found a significant relationship between the two variables. Arockia and Sangeetha (2013) also found a significant relationship between emotional intelligence and academic performance of students. Grace (2012) and Hossein, Razieh, Abdolhamid, and Hamideh (2015) also found significant relationships between emotional intelligence and academic achievement of students in Biology. Adil (2012) however, found a contrasting result showing that emotional intelligence does not significantly relate to academic performance.

In Onitsha educational zone, literature has only shown little about studies on emotional intelligence and academic achievement of secondary school students in mathematics. Again, with the inconclusive findings about emotional intelligence, the need arises that more empirical studies be conducted to determine the predictive power of emotional intelligence on students' achievement in mathematics.

Purpose of the Study

The purpose of the study was to investigate emotional intelligence as a predictor of secondary school students' achievement in mathematics in Onitsha Education Zone. Specifically, the study seeks to determine the:

- Predictive power of emotional intelligence on students' achievement scores in mathematics.
- Relative predictive power of emotional intelligence dimensions (perceiving emotions, facilitating thoughts, understanding emotions and managing emotions) on students' achievement in mathematics.

Research Questions

The following research questions guided the study.

- What is the predictive power of emotional intelligence on students' academic achievement in mathematics?
- What are the relative predictive powers of emotional intelligence dimensions (perceiving emotions, facilitating thoughts, understanding emotions and managing emotions) on students' academic achievement in mathematics?

Hypotheses

The following hypotheses were tested at 0.05 level of significance.

- Students' emotional intelligence scores do not significantly predict their academic achievement in mathematics.
- Students emotional intelligence dimensions (perceiving emotions, facilitating thoughts, understanding emotions and managing emotions) do not significantly predict their academic achievement in mathematics.

Methods

The design of the study was a correlational survey. The study was carried out in Onitsha Education Zone of Anambra state. The population of the study was 6, 381 senior secondary year two students in all the public senior secondary schools in Onitsha education Zone of Anambra state. The sample of the study was 600 SS2 mathematics students drawn using multi-stage sampling procedure involving simple and purposive sampling techniques.

The instrument for the study was Emotional Intelligence Questionnaire (EIQ) adopted from Mayer-Salovey-Caruso (2004) Emotional Intelligence Test (MSCEIT), a standardized instrument for measuring Emotional Intelligence. MSCEIT is standardized instrument for measuring intelligence which consists of 141 scales put into four clusters that measured namely perceiving emotions, facilitating thoughts, understanding emotions and managing emotions. Across the 8 tasks, the responses required take different forms. The test was designed this way so that the results across the response methods can be generalized, and also minimize the associated error in measurement (Mayer et al., 2003). So, some tasks use a 5-point rating scale, whereas others require a multiple-choice response. The reliability of the instrument was 0.84.

The researcher with the assistance of three trained research assistants administered the instruments to the students. The research assistants were oriented on the objectives of the study and how to administer the questionnaire. Before administering the questionnaire, they collect the students mathematics scores for two terms and registered the serial numbers on the of the students on the instruments to be given them accordingly. The instrument was collected the same day. To ensure reduction in sample mortality, the research assistants cross-checked the instruments to ensure that the items were completely filled. Data collected were analyzed Pearson correlation coefficient, simple and multiple linear regressions. The interpretation of the correlation coefficient was according to Okoye (2015) as follows: $r = .00$, no relationship, $r = \mp.01$ *to* ∓ 0.20, low relationship; $r = \mp.20$ *to* ∓ 0.50, slight to fair relationship; $r = \mp.50$ *to* ∓ 0.70, substantial relationship; $r = \mp.70$ *to* ∓ 0.99, high relationship and $r = \mp 1.00$, perfect relationship. The null hypotheses were tested at 0.05 level of significance. The decision rule was to reject the null hypothesis when pvalue was less than 0.05, otherwise, the null hypothesis was not accepted.

Results

Research Questions 1: What is the predictive power of emotional intelligence on students' academic achievement in mathematics?

TABLE 1 PREDICTION OF STUDENTS' ACHIEVEMENT IN MATHEMATICS BY EMOTIONAL INTELLIGENCE

Model	R	R^2	Adjusted R^2	Std. Error	Decision
1	.008[a]	.002	.012	11.640	Low positive relationship
a. Predictor: (Constant), EI					

Table 1 shows a low positive relationship (R = 0.008) exists between students' emotional intelligence and their academic achievement in mathematics. The R-Square value of 0.002 indicates that 0.2% of the variance in mathematics scores is explained by emotional intelligence.

Research Questions 2: What are the relative predictive powers of emotional intelligence dimensions (perceiving emotions, facilitating thoughts, understanding emotions and managing emotions) on students' academic achievement in mathematics?

TABLE 2 RELATIVE CONTRIBUTIONS OF THE INDIVIDUAL DIMENSIONS OF EMOTIONAL INTELLIGENCE IN THE PREDICTION OF ACHIEVEMENT SCORES IN MATHEMATICS

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	45.491	1.616		28.149	.000
	Perceiving emotions	.166	.106	.103	1.569	.017
	Facilitating thoughts	.228	.105	.143	2.174	.030
	Understanding emotions	.114	.149	.047	.765	.445
	Managing emotion	.021	.022	.251	2.871	.002
a. Dependent Variable: Average Mathematics Score						

Table 2 shows the standardized beta coefficient which indicates correlation between the predictor variables and academic achievement in mathematics. The unstandardized beta coefficient shows the prediction powers of each dimensions of emotional intelligence which indicates their relative contribution or effects on achievement in mathematics. The table shows that a low positive predictive relationship (R = 0.103) exist between perceiving thought and students' academic achievement in mathematics, facilitating thoughts has a low negative relationship (R = 0.143) with academic achievement in mathematics, while understanding emotions has a low positive relationship (R = 0.047) with academic achievement in mathematics where managing emotions has a low positive relationship of 0.251 with achievement in mathematics. Perceiving emotions is shown to contribute 0.166 to achievement in mathematics whenever students' emotional intelligence increases by a unit, while holding other dimensions constant. With a unit increase, facilitating thought increases achievement in mathematics by .228, with understanding emotions increasing achievement in mathematics by .114 while managing emotions with a unit increase, increases achievement in mathematics by 0.021. The order of relative prediction (influence) of academic achievement in mathematics by the dimensions of maternal deprivation from the highest to lowest is; facilitating thoughts, perceiving emotions, understanding emotions and managing emotions.

Hypothesis 1: Students' emotional intelligence scores do not significantly predict their academic achievement in mathematics.

TABLE 3 ANOVA ON SIGNIFICANCE OF PREDICTION OF ACADEMIC ACHIEVEMENT SCORES IN MATHEMATICS BY EMOTIONAL INTELLIGENCE

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.286	1	3.286	.024	.048[b]
	Residual	78713.881	598	135.480		
	Total	78717.166	599			
a. Dependent Variable: Average Mathematics Score						
b. Predictors: (Constant), Emotional Intelligence						

Table 3 shows that emotional intelligence is not a significant predictor of achievement scores in mathematics F (1, 599) = 0.024, P (0.048) < 0.05. The null hypothesis was accepted. Therefore, students' emotional intelligence scores significantly predict their academic achievement in mathematics.

Hypothesis 2: Students emotional intelligence dimensions (perceiving emotions, facilitating thoughts, understanding emotions and managing emotions) do not significantly predict their academic achievement in mathematics.

Data relating to hypotheses 2 is contained in Table 2.

Table 2 shows that perceiving emotions is a significant predictor of academic achievement in mathematics, t = 1.569, P (0.017) < 0.05, facilitating thoughts is a significant predictor of academic achievement in mathematics, t = 2.174, P (0.030) < 0.05, managing emotions was a significant predictor of academic achievement in mathematics, t = 2.871, P (0.002) < 0.05 while understanding emotions is not a significant predictor of academic achievement in mathematics, t = 0.765, P (0.445) > 0.05.

Discussion

The findings of the study revealed that emotional intelligence significantly predicted students' achievement in mathematics. Emotional Intelligence enables a student to identify, evaluate, control, and express emotions in an effective and positive way. A student with high emotional intelligence is able to communicate better, lessen their anxiety and stress, resolve conflicts, improve relationships, empathize with others, and overcome life's challenges. Developing a high emotional can help determine success, it can affect students' choices by creating options they might not have thought otherwise or considered to be possible. The way a student manages emotions therefore, can have an impact on everything from his or her relationships with classmates to performance in the classroom. This is why the study finding showed emotional intelligence to be a significant predictor of academic achievement in mathematics. Students, who are better able to understand and manage their emotions effectively, a skill known as emotional intelligence, do better at school than their less skilled peers, as measured by grades and standardized test scores. Students with higher emotional intelligence may be better able to manage negative emotions, such as anxiety, boredom and disappointment that can negatively affect academic performance. Also, these students may be better able to manage the social world around them, forming better relationships with teachers, peers and

family, all of which are important to academic success.

Another possible explanation of the observed results is that the skills required for emotional intelligence, such as understanding human motivation and emotion, may overlap with the skills required to master certain subjects, such as history, mathematics and language, giving students an advantage in those subject areas. As an example, a student may good at mathematics and science but low in emotional intelligence; who has difficulty seeing when others are irritated, worried or sad. Such student does not know how people's emotions may cause future behaviour. She does not know what to do to regulate her own feelings and as a result, does not recognize when a best friend, is having a bad day, making the best friend mad because of insensitivity. The best friend then does not help the students (as she usually does) later in mathematics class, a class the student often struggles in because it requires her to analyse and understand the motivations and emotions behind the numbers as well.

The student feels ashamed that the ability to do the work is lacking and that that other students seem to find it easy. The student is also upset that the best friend is mad at the insensitivity shown. The student cannot seem to shake these feelings, and is not able to concentrate on mathematics problems in the next class. Because of the students' low emotion management ability, the student cannot bounce back from the negative emotions and finds out that he or she is struggling even in subjects she is good at. The emotional intelligence of perceiving emotions results in self-awareness. Self-awareness is the ability to recognise one's emotions, emotional triggers, strengths, weaknesses, motivations, values and goals and understand how these affect one's thoughts and behaviour. When students are able to label the emotion and understand its cause, they are in a much better place to address the issue with appropriate action, such as putting hand-up to take on additional work that might inspire them or finding productive ways to deal with a difficult situation.

Facilitating thoughts or empathy is the ability to connect emotionally with others and take into consideration their feelings, concerns and points of view. It is an important skill to have when negotiating with internal and external factors that influence academic achievement, as it enables one to anticipate the other's needs and reaction. Empathy is a key part of welcoming and appreciating different points of view to solve problems and come up with innovative ways forward, making the students to learn from others, different ways to solve a problem. Empathy is also essential for group study. Noticing and responding to the emotional needs of the students in the class with makes for a happy study culture.

Drawing on one's self-awareness, emotional management is the ability to regulate one's emotions. Every student including those with a high emotional intelligence experiences bad moods, impulses and negative emotions like anger and stress, but self-management is the ability to control these emotions rather than having them control one. This could mean delaying response to highly stressful or aggressive situations. Deciding to sleep on a very poor performance on a mathematics test means the student can react thoughtfully and with a clear-head, rather than impulsively. Negative emotions and impulsive behaviour not only negatively affects those around a student, but can take a toll on their wellbeing too.

The findings of the study are in line with the findings of Saloma, Noor, Nor, Gladys, Muhammad, and Nur, (2014), Arockia and Sangeetha (2013), Grace (2012) and Hossein, Razieh, Abdolhamid, and Hamideh (2015) that emotional intelligence and academic achievement are related. The findings of the study however contrast that findings of Adil (2012) that there is no significant relationship between emotional intelligence and academic achievement of students.

Conclusion

The conclusion drawn from the study is that emotional intelligence is a significant predictor of academic achievement in mathematics. It positively enhances students' achievement in mathematics through emotional perceptions, facilitating thoughts and emotional managements.

Recommendation

The following recommendations were made in the light of the findings of the study.

- School guidance and counsellors should organise seminars and orientation exercise to acquaint students of the important of emotional intelligence in the learning of mathematics.
- Students with high level of emotional disequilibrium should be referred by the mathematics teachers to the school counsellor and given proper attentions that could help them to manage their emotions properly.

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