An investigation of the Relationship between Emotional Intelligence and Academic Achievement among students enrolled in First-Year Mathematics Core Courses at the University of Guyana's Turkeyen Campus

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Abstract:

This study looked at how students' academic success taking first- year mathematics core courses in the Faculty of Natural Sciences at the University of Guyana, Turkeyen Campus correlated with their emotional intelligence. The sample comprised one hundred and forty-seven first-year randomly selected students who were registered for both MTH1101 – Algebra and MTH1202 – Calculus 1 in the academic year 2021/2022. The students' emotional intelligence (EI) scores were computed using the Schutte Self-Report Emotional Intelligence Test while their overall grades for both courses were obtained from the respective marksheets. For data analysis, the Spearman's Rank Correlation was used to establish whether there is a link between students' mathematical achievement and emotional intelligence. According to the findings, there is no statistically significant relationship between students' EI scores and their performance in either of the two mathematics core courses.

Keywords —**Emotional Intelligence, Mathematics Performance, Academic Achievement, Algebra, Calculus, Spearman's Rank Correlation.**

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I.   INTRODUCTION

Over the past 30 years, there has been a growing interest in social and emotional competencies and their influence on academic success [1]. Many studies propose that personal, social and emotional aspects could predict change and success in life [2]. Initially, intellectual intelligence was deemed as the intelligence that determines the success of one's life. However, later on, intellectual intelligence was not considered to be the only type of intelligence that can positively affect one's life but other non-intellectual types such as personal, emotional and social factors. In fact, a study in 2015 states that one of the most significant factors that affect learning is intelligence that manifest itself as spiritual, intellectual and emotional intelligence [3].

In today's society, intelligence is considered to be one of the most desirable personality traits [4]. Emotional intelligence has now come under the spotlight of predicting an individual's skills and abilities to perform in the workplace, in educational institutions and even in their personal life. Recently, researchers have been captivated by how emotional intelligence can help a student improve their academic performance [5]. Accurately recognizing the nature of emotions and their relationships is a necessary skill for emotional intelligence. It entails recognizing and assessing emotions, comprehending the information contained in emotions, and controlling and regulating emotions in order to promote emotional and intellectual growth [6].

It is believed that individuals who demonstrate strong emotional intelligence are adept at knowing the emotions of others and knowing their own emotions extremely well. Individuals who possess this trait are pleasant, optimistic and resilient [7]. Further, emotional intelligence as a model comprised four elements which includes perception, use, understanding and management of emotions [8]. However, a more generic framework was introduced by Daniel Goleman in 1998 which encompasses the domains of self-awareness, self-control, drive, empathy, and social skills [9].

Recent research studies have shown that there is a link between students' social and emotional skills and academic performance. Researchers explained that social and emotional competencies are significant contributors to the academic performance of students when there is a conducive environment regarding social and emotional learning. Students' emotional intelligence is seen to be an excellent indicator of both their current and future academic performance [8]. Also, several researchers hypothesized a link between enhanced academic achievement in students and higher levels of emotional intelligence [10, 11].

An increasing amount of evidence indicates that emotional intelligence, cognitive skills, and academic success are significantly connected [12]. Evidence from research implies that social and emotional developments are crucial towards students' academic performance in the primary, secondary and tertiary levels of education [13]. Further, literature suggests that the learning process can be enhanced by students who possess high levels of emotional intelligence [14, 15].

For centuries, it has been the philosophy of many academics that Mathematics enhances the human brain, advances sound thinking, and boosts one's reasoning capacity. In addition, it stimulates an individual's development which contributes to national growth and the success of the economy. Further, it equips individuals to solve real-life problems by building their confidence, quickening their minds and developing their self-esteem [16].

Mathematics, as one of the basic sciences, serves as a requirement for most programs in universities [17]. In courses, learners are expected to function under demanding circumstances and researchers are of the belief that one of the things that will guarantee success is emotional intelligence. [18]. However, previous studies investigating this belief have produced varied outcomes. The results from a 2020 study done by Ranie et. al showed that emotional intelligence and mathematical achievement are positively correlated. On the contrary, a similar done in 2020 by Ningsih, suggested that emotional intelligence and mathematical achievement are not positively correlated [19].

This study will examine the connection between emotional intelligence and academic accomplishment among first-year Mathematics core course students in the Faculty of Natural Sciences at the University of Guyana's Turkeyen Campus. It is geared to identify and examine the following:

1) Is there a significant relationship between students' level of emotional intelligence and their achievement in MTH1101 – Algebra?
2) Is there any correlation between students' level of emotional intelligence and their achievement in MTH1202 – Calculus 1?

II. MATERIALS AND METHODS

A correlational descriptive survey design was used for this investigation. For the academic year

2021–2022, the Faculty of Natural Sciences at the University of Guyana, Turkeyen Campus, offered two first-year mathematics core courses, MTH1101 – Algebra, and MTH1202 – Calculus 1. The sample comprised one hundred and forty-seven first-year randomly selected students who were registered for both first-year mathematics core courses in the Department of Mathematics, Physics and Statistics. These students were intentionally chosen for this study because in the Faculty of Natural Sciences these two courses serve as foundational service courses in determining whether students can go on to pursue higher level Science, Technology, Engineering and Mathematics programs.

For this study, the Schutte Self-Report Emotional Intelligence Test was used to determine the students' emotional intelligence. The test was developed by Schutte et al. in 1998 in the form of a questionnaire. It consists of 33 items and utilized a five-point Likert scale (1 - Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree) to gather students' responses [20]. The range of the emotional intelligence scores is 33 to 165. The mean score from large samples for this questionnaire is 124, with scores below 111 considered being unusually low emotional intelligence, between 111 and 137 to be average emotional intelligence and above 137 to be unusually high emotional intelligence [21].

The items from the questionnaire were inputted into Google Forms and students were sent the link via email to access the questionnaire and fill it out. All participants were informed that their involvement in this study is voluntary, their responses will be treated with utmost confidentiality and will be used for the intended purpose of the study. Students' responses were downloaded from Google Forms and the data of students' emotional intelligence scores was stored in a Microsoft Excel file. Additional data, which included students' final grades for MTH1101 – Algebra and MTH1202 – Calculus 1, were obtained from the marksheets for the academic year 2021/2022, were added to the file. The file was then encoded andanalyzed in Statistical Package for the Social Sciences (SPSS).

III. DATA ANALYSIS TECHNIQUE

Data from the Microsoft Excel file which included the grades for MTH1101 – Algebra and MTH1202 – Calculus 1 and the Emotional Intelligence score were transferred to SPSS for analysis. The Emotional Intelligence (EI) scores ranged from 33 to 165. However, EI scores below 111 were considered low, while scores above 137 were considered high and scores between 111 and 137 were considered to be average. Thus, the EI scores were categorized and separated according to high, average and low, while grades for the two courses ranged from A to F. Additionally, the grades were coded as follows in the SPSS software: $4 - A, 3 - B, 2 - C, 1 - D, 0 - F$.

The relationship between emotional intelligence and students' academic achievement in Algebra and Calculus 1 was examined using the Spearman's Rank Correlation to address the two research questions. Three correlation tests were conducted for the three ranges of high, average and low.

IV. RESULTS

TABLE I
RELATIONSHIP BETWEEN HIGH EI SCORES AND MTH1101-ALGEBRA GRADES

Correlations

			GRADE1	EI_1
Spearman's rho	Algebra	Correlation Coefficient	1.000	.215
		Sig. (2-tailed)	.	.550
		N	10	10
	High EI	Correlation Coefficient	.215	1.000
		Sig. (2-tailed)	.550	.
		N	10	10

According to the Table I, there is a marginally positive link $(r_s = 0.215)$ between students' performance in MTH1101 – Algebra and high emotional intelligence scores $(r_s = 0.215)$.

The following hypotheses were tested to see if there is a correlation between the two variables:

Null Hypothesis: There is no correlation between students' performance in MTH1101 – Algebra and high emotional intelligence scores.

Alternative Hypothesis: High emotional intelligence scores are related to students' performance in MTH1101 – Algebra.

The non-parametric test results showed $p-value = 0.550$, $(p-value > 0.05)$, indicating that the outcome is not statistically significant. Hence, there is enough data to support the null hypothesis. As a result, there is no correlation between students' performance in MTH1101 – Algebra and their average emotional intelligence ratings.

TABLE II
RELATIONSHIP BETWEEN AVERAGE EI SCORES AND MTH1101-ALGEBRA GRADES

Correlations

			GRADE1	EI_1
Spearman's rho	Algebra	Correlation Coefficient	1.000	.109
		Sig. (2-tailed)	.	.263
		N	107	107
	High EI	Correlation Coefficient	.109	1.000
		Sig. (2-tailed)	.263	.
		N	107	107

Table II shows a very slight positive association $(r_s = 0.109)$ between the average emotional quotient scores of the students and how well they performed in MTH1101 – Algebra.

To determine whether there is a correlation between the two variables, the following hypotheses were investigated:

Null Hypothesis: There is no correlation between students' performance in MTH1101 – Algebra and their average emotional intelligence scores.

Alternative Hypothesis: There is a correlation between students' performance in MTH1101 –

Algebra and their average emotional intelligence scores.

The results of the non-parametric test showed a $p-value$ of 0.26, which is more than 0.05 and indicates that the result is not statistically significant. The null hypothesis can therefore be supported by the available data. Thus, there is no association between students' MTH1101 – Algebra performance and their average emotional intelligence scores.

TABLE III
RELATIONSHIP BETWEEN LOW EI SCORES AND MTH1101-ALGEBRA GRADES

Correlations

			GRADE3	EI_3
Spearman's rho	Algebra	Correlation Coefficient	1.000	-.026
		Sig. (2-tailed)	.	.893
		N	30	30
	Low EI	Correlation Coefficient	-.026	1.000
		Sig. (2-tailed)	.893	.
		N	30	30

Table III shows that there is only a very slight negative association $(r_s = -0.026)$ between students' performance in MTH1101 – Algebra and their low emotional intelligence scores.

The following hypotheses were looked into to see if there is a correlation between the two variables:

Null Hypothesis: There is no connection between students' performance in MTH1101 – Algebra and their emotional intelligence scores.

Alternative Hypothesis: Low emotional intelligence scores are related to students' performance in MTH 1101 - Algebra.

With a $p-value$ of $0.893(p-value > 0.05)$, the non-parametric test result cannot be considered statistically significant. As a result, the null hypothesis is supported by enough data. There is no correlation between students' emotional intelligence scores and their MTH1101 – Algebra scores.

TABLE IV
RELATIONSHIP BETWEEN HIGH EI SCORES AND MTH1102-CALCULUS 1GRADES

Correlations

			EI_1	Cal_gr1
Spearman's rho	High EI	Correlation Coefficient	1.000	-.210
		Sig. (2-tailed)	.	.560
		N	10	10
	Calculus	Correlation Coefficient	-.210	1.000
		Sig. (2-tailed)	.560	.
		N	10	10

TABLE V
RELATIONSHIP BETWEEN AVERAGE EI SCORES AND MTH1202-CALCULUS 1 GRADES

Correlations

			EI_2	GRADE2
Spearman's rho	Average EI	Correlation Coefficient	1.000	.054
		Sig. (2-tailed)	.	.579
		N	107	107
	Calculus	Correlation Coefficient	.054	1.000
		Sig. (2-tailed)	.579	.
		N	107	107

Table IV shows that there is a very slight negative association $(r_s = -0.210)$ between students' performance in MTH1202 – Calculus 1, and high emotional intelligence scores. The following theories were looked into to see if there is a relationship between the two variables:

Null Hypothesis: There is no correlation between students' performance in MTH1202 – Calculus 1 and their emotional intelligence scores.

Alternative Hypothesis: Students who score highly on emotional intelligence also perform better in MTH1202 – Calculus 1.

The results of the non-parametric test showed a $p-value$ of 0.560, which is more than 0.05 and indicates that the result is not statistically significant. The null hypothesis can therefore be supported by the available data. Thus, there is no association between students' MTH1202 – Calculus 1 performance and their mean emotional intelligence ratings.

Table V demonstrates that there is a very slight positive link $(r_s = 0.054)$ between students' performance in MTH1202 – Calculus 1 and their average emotional intelligence scores.

The following hypotheses were tested to see if there is a correlation between the two variables:

Null Hypothesis: Average emotional intelligence scores and students' performance in MTH1202 – Calculus 1 do not correlate.

Alternative Hypothesis: Average emotional intelligence scores and students' performance in MTH1202 – Calculus 1 have a correlation.

The non-parametric test results showed $p-value = 0.579$, $(p-value > 0.05)$, indicating that the outcome is not statistically significant. Hence, there is enough data to support the null hypothesis. As a result, there is no correlation between students' performance in MTH1202 – Calculus 1 and their average emotional intelligence ratings.

TABLE VI
RELATIONSHIP BETWEEN LOW EI SCORES AND MTH1202-CALCULUS 1GRADES

Correlations

			EI_3	GRADE3
Spearman's rho	Low EI	Correlation Coefficient	1.000	.129
		Sig. (2-tailed)	.	.496
		N	30	30
	Calculus	Correlation Coefficient	.129	1.000
		Sig. (2-tailed)	.496	.
		N	30	30

Table VI shows that students' performance in MTH1202 – Calculus 1 and low emotional intelligence scores have a very weal positive connection ($r_s = 0.129$).

To determine whether there is a correlation between the two variables, the following hypotheses were investigated:

Null Hypothesis: Low emotional intelligence scores have no effect on students' performance in MTH1202 – Calculus 1.

Alternative Hypothesis: Low emotional intelligence scores are correlated with students' performance in MTH1202 – Calculus 1.

With a $p-value\ of$ 0.496 ($p-value > 0.05$), the result of the non-parametric test cannot be considered statistically significant. As a result, the null hypothesis is supported by enough data. Hence, there was no relationship between students' emotional intelligence scores and their performance in MTH1202 – Calculus 1.

V. DISCUSSION

This research looked into the connection between students' academic success and emotional intelligence taking first- year mathematics core courses in the Faculty of Natural Sciences. Spearman's Correlation tests were conducted for three levels of EI scores, specifically high, average and low, and students' academic achievement in MTH1101 – Algebra and MTH1202 – Calculus 1.

Findings of this study revealed that there exist very weak positive relationships between high and average EI scores and students' academic achievement in MTH1101 – Algebra as well as a very weak negative relationship between low EI scores and their academic achievement. As it relates to MTH1202 – Calculus 1, there exist a very weak negative relationship between high EI scores and students' academic achievement. For average and low EI scores, there exist very weak positive relationships between students' EI scores and their academic achievement. However, there was no statistically significant correlation between students' EI scores, at the various levels, and their achievement in both mathematics core courses.

These findings are supported by previously done studies that investigated the relationship between students' EI scores and their achievement in mathematics. Sahinidis et al. (2016) study proposed that that emotional intelligence has no effect on students' academic performance [22]. A similar study done by Azimifar (2013) hypothesized that there is no statistically significant link between students' EI scores and their scholastic success in mathematics [23]. Meshkat's (2011) study also revealed that EI sores and mathematical academic achievement are not significantly related [24]. Also, Fatum's (2008) study proposed that there is no significant correlation between students' EI score and their mathematics performance [25]. In addition, Parker et al. (2004) and Petrides et al. (2004) in their studies indicated that relationship between students' EI scores and academic performance were not statistically significant [26, 27]. Likewise, another similar study done by Click (2002) also agrees with the result of this current study in that students' academic achievement and their EI scores were very weak and not statistically significant [28].

Despite the fact that various preceding studies have produced similar results, some studies have shown a positive correlation between the students' EI scores and their achievement in mathematics. According to Sandana et al. (2018) and Jannah et al. (2016) there exist positive correlations between

student's emotional intelligence and their mathematics performance [29, 30].

VI.   CONCLUSION

According to the study's findings, there is no statistically significant correlation between students' performance in MTH1101 – Algebra and MTH 1202 – Calculus 1 and their EI scores at the various levels.

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