FOSTERING ACADEMIC SUCCESS: GRIT AND EMOTIONAL INTELLIGENCE AS PREDICTIVE FACTORS IN SECONDARY SCHOOL PERFORMANCE IN MATHEMATICS

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Abstract
Academic performance in secondary school in general and mathematics in particular is a complex and multifaceted construct that extends far beyond the confines of standardized tests and letter grades. While these traditional metrics provide a snapshot of a student's knowledge and skill acquisition, they often overlook the crucial role of non-cognitive factors. However, growing research highlights the significant influence of non-cognitive factors, particularly emotional intelligence (EI) and grit, on student performance in mathematics which is a fundamental subject in secondary education. This thus prompted the study that sought to investigate the prediction of grit and emotional intelligence on the mathematics performance of secondary school students. It adopted the correlational research design. To direct the study, three null hypotheses and three research questions were developed. A sample of 102 was drawn using a stratified random sampling technique based on gender. The mathematics performance Test, Emotional Intelligence Appraisal, and the Grit Scale were the instruments used. The validity of these tools was guaranteed. Split half and Cronbach alpha method were used to obtain reliability coefficients of .62, .70, and .76 for the three instruments respectively. Data were analyzed using simple and multiple regressions. The result revealed that grit did not significantly independently predict academic performance, emotional intelligence independently did predict it while grit and emotional intelligence jointly significantly predict academic performance in mathematics. Considering findings, it was recommended amongst others that educators should be provided or engage in training on strategies to foster grit and EI in students in mathematics instruction

Introduction

In the realm of education, understanding the factors that contribute to academic performance and success has long been a subject of intense inquiry. Academic performance or achievement refers to an individual's achievements and accomplishments within an educational setting, typically measured by grades, test scores, and overall success in coursework or academic endeavours. According to Zhao (2017), is the actual performance of students‘ mastery of academic knowledge and skills as demonstrated through examinations after systematic knowledge and skills learning. Academic performance and success in secondary school is a complex and multifaceted construct that extends far beyond the confines of standardized tests and exams, letter grades, and cognitive abilities. These traditional cognitive metrics provide a snapshot of a student's knowledge and skill acquisition that does not give a comprehensive picture. Academic performance in secondary school in general and, particularly in subjects like mathematics, is often seen as a product of pure cognitive ability. Students are expected to master complex concepts, solve intricate problems,

and demonstrate their understanding through tests and assignments. And traditionally, success in these is been evaluated by test scores and grades. These measures offer valuable insights into a student's grasp of core concepts and their ability to apply knowledge in a testing environment. Particularly in mathematics which within the realm of secondary school is regarded as a fundamental subject that success in is a prerequisite and cornerstone of future success and opportunities.

However, the ability to excel in mathematics extends beyond mere cognitive abilities as previously stated. It goes beyond simply memorizing formulas and manipulating numbers. Students need to be able to manage the frustration that can arise from encountering difficult problems. They need the focus and perseverance to work through challenging concepts, and the self-awareness to identify areas where they need additional support. Furthermore, effective communication skills are crucial for collaborating with peers and understanding the explanations provided by teachers. This becomes particularly important during secondary school, a period marked by significant intellectual, social, and emotional development. Secondary school students are not simply vessels to be filled with knowledge; they are individuals navigating a period of rapid personal growth. In recognition of these, recent research paints a more detailed picture, revealing the significant influence of non-cognitive factors on achieving academic success generally and mathematics in particular. Thus, researchers have increasingly turned their attention to non-cognitive factors that play a crucial role in predicting academic performance. Among these, two key constructs have emerged as significant predictors: Emotional Intelligence (EI) and Grit.

Grit and Academic Performance

Grit refers to the perseverance and passion for long-term goals, particularly in the face of obstacles and setbacks. According to Eteng-Uket and Njaka (2023), the concept of grit has only recently begun to take centre stage in educational research. They further viewed that according to the concept developed by Duckworth and colleagues, interest in grit came from the realization that beyond cognitive capacities, the impact of non-cognitive factors on students‘ learning experience cannot be overlooked. They further went on to view that the relatively new introduction of the concept of grit has made it a fertile area of interest for researchers seeking to develop a better understanding of what influences or increases students' school achievement. Grit articulates the theorem that a person combines passion and perseverance to achieve long-term goals. Grit is defined as perseverance and passion for long-term goals (Duckworth, et al 2007)

Unlike traditional measures of intelligence or talent, Grit emphasizes the importance of sustained effort and resilience in achieving success. Individuals high in Grit demonstrate a combination of perseverance, self-discipline, and intrinsic motivation that enables them to overcome challenges and stay focused on their objectives over time. In the realm of education, Grit has been identified as a key determinant of academic achievement and success. Students with high levels of Grit are more likely to set ambitious goals, exert effort toward their attainment, and persist in the face of academic difficulties. They view setbacks as opportunities for growth rather than insurmountable barriers, adopting a growth mindset that fuels their continuous learning and improvement. Gritty students work very hard and longer and are more disposed to engage in cautious practice to foster school success or academic achievement. They are usually tenacious and industrious and are not easily

dispirited by impediments, spend more time studying, and are generally likely to be more involved in their academic activities (Cross 2013; Datu et al 2018; Lee & Sohn 2017; Ivcevic & Brackett 2014; Owusu et al), 2020). On the other hand, students not gritty are less determined or less assiduous, they are regularly influenced by new activities and are not able to set lasting goals for themselves, they usually lack the impetus to concentrate on enduring academic projects, tasks, or assignments, (Perez, 2015). Generally, this implies that learners with high grit levels generally put extra effort and time into their academic activities or studies in school thereby attaining higher academically

In the context of mathematics education, Grit can manifest as the resilience and determination students exhibit in mastering mathematical concepts and solving complex problems. Students high in grit are likely to approach mathematical challenges with a growth mindset, viewing failures as opportunities for learning and improvement rather than indications of innate ability. They may persist in their efforts, employing strategies to overcome difficulties and gradually enhance their mathematical proficiency over time. Although research reports have provided inconclusive reports about the influence of grit on academic performance as some research findings revealed that grit was significantly related to academic performance (Bowman et al 2015; Cross 2013; Datu et al 2018; Duckworth et al 2007; Gat et al 2021; Mamah 2022). At the same time, other research reports revealed that grit is not related to either does predict academic achievement (Bazelais et al.2018; Chang, 2014; Gruenberg et al. 2018; Huhn et al 2021; Jaeger et al., 2010; Nelson 2016; Palisoc et al.2017). These inconclusive reports present ample gap for further research inquiry

Emotional Intelligence and Academic Performance

Another cognitive factor that influences academic performance is Emotional intelligence. Emotional Intelligence (EI), coined by psychologists Peter Salovey and John Mayer and popularized by Daniel Goleman in the 1990s, refers to the ability to recognize, understand, regulate, and express emotions effectively in oneself and others. According to Eteng-Uket and Njaka (2023), EI refers to a set of abilities that enable a person to use emotion to adapt, perceive, understand, and control their moods. They also use emotional data to sharpen their cognitive and logical reasoning. It encompasses a range of skills including self-awareness, self-regulation, social awareness, and relationship management. Rather than solely relying on intellectual abilities, Emotional Intelligence emphasizes the importance of emotional skills in navigating the complexities of human interactions and decision-making.

Emotional Intelligence (EI), characterized by the ability to recognize, understand, and manage one's own emotions as well as those of others, also plays a crucial role in shaping academic success and performance in mathematics. EI encompasses skills such as self-regulation, stress management, and interpersonal communication, all of which are essential for effective learning and problem-solving in mathematics. Students with high Emotional Intelligence are better equipped to navigate the emotional challenges inherent in learning mathematics. They are likely to exhibit greater self-awareness, recognizing their strengths and weaknesses in mathematical reasoning and seeking support when needed. Additionally, they demonstrate enhanced self-regulation, managing match-related anxiety and frustration more effectively, and maintaining a positive attitude toward learning mathematics. Students high in EI are also likely to be adept at collaborating with peers, seeking assistance from teachers, and leveraging resources to enhance their understanding of mathematical concepts.

This has been collaborated by research findings that show that emotional intelligence is influenced and related with academic performance (Ali & Mohamad 2020; Amalu, 2018; Barchard, 2003; Banat & Rimawi 2014; Estrada et al 2021; Prabha, 2015; Omenen, 2015; Bakhshi, et al., 2016; Herut et al 2023; Karimi et al 2020; Meyer et al.,2021 MacCannan et al 2020; Nwadinigwe, & Azuka-Obieke 2012; Parker, et al.2004; Parker, et al.2005: Parker, et al. 2005 &Taseer et al 2023). Though Mohzan et al (2013) and Huhn et al (2021) research findings did not reveal that there is a correlation between emotional intelligence and academic ability

Grit, Emotional Intelligence, and Academic Performance

While Emotional Intelligence and Grit are distinct constructs, they are closely intertwined and synergistic in their effects on academic performance. Students with high Emotional Intelligence are better equipped to regulate their emotions and maintain focus on long-term goals, essential components of Grit. Conversely, individuals high in Grit are more likely to exhibit emotional resilience and perseverance in the face of academic challenges, attributes that are characteristic of Emotional Intelligence. Together, these constructs form a powerful framework for understanding and predicting academic success,

Grit and Emotional Intelligence are not independent predictors of academic performance in mathematics but rather complementary constructs that are likely to interact synergistically to influence students' mathematical achievement. Students with high levels of Grit are more likely to persist in their efforts to overcome mathematical challenges, while those with high Emotional Intelligence are better equipped to regulate their emotions and adapt their problem-solving strategies in mathematics. Together, these constructs may tend to contribute to a resilient mindset characterized by perseverance, adaptability, and a growth-oriented approach to learning mathematics. The features of people with high emotional intelligence, such as making every effort to be efficient and effective, who do not hesitate to do more challenging tasks to deal with the difficulties they face, are very similar. They are also found in gritty people. Studies on grit and emotional intelligence have been able to establish a connection between these two factors (Ain, et al., 2021; Eteng-Uket & Njaka 2023; Hamilton, 2020; Özer, 2021; Resnik, et al., 2021) however not about academic performance specifically in mathematics, an angle, and a gap this study intends to fill

This shows, that there is a dearth of research concerning the prediction of grit and emotional intelligence on the academic performance of secondary school students. Thus, there is a much need to close this gap. This is more so as despite the recognition of mathematics as a crucial subject in secondary education, many students struggle to achieve proficiency in this discipline, leading to concerns about their academic success and future opportunities. Cognitive factors such as intelligence and aptitude have traditionally been emphasized in understanding mathematical achievement. There is growing evidence to suggest that non-cognitive factors, particularly Grit and Emotional Intelligence (EI), may play significant roles in predicting academic performance in mathematics among secondary school students. However, the specific interplay between Grit, Emotional Intelligence, and academic performance in mathematics remains relatively understudied, particularly within the context of secondary education. Understanding how these non-cognitive factors influence students' mathematical achievement could provide valuable insights for educators, instructional designers, test and measurement experts, and policymakers seeking to enhance mathematics

instruction and support student success in this critical subject. It is against this backdrop that this research is carried out to investigate the extent to which Grit and Emotional Intelligence serve as predictors of academic performance in mathematics among secondary school students.

To direct this research, the following research questions were developed:

1. To what extent does grit predict the academic performance of students
2. To what extent does emotional intelligence predict the academic performance of students
3. To what extent do grit and emotional intelligence jointly predict the academic performance of students

The following null hypotheses were tested at a 0.05 level of significance

1. Grit does not significantly predict the academic performance of students
2. Emotional intelligence does not significantly predict the academic performance of students
3. Grit and emotional intelligence jointly do not significantly predict the academic performance of students

Methodology

Research Design

The correlation design by multiple prediction was used as the research design for the study. According to Kpolovie (2010), correlation research is a method used to determine the strength and direction (positive or negative) of a relationship between a dependent variable (also known as a criterion variable- academic performance) and one or more independent variables (predictor variable-grit and emotional intelligence). The multiple prediction design was used in this one. According to Kpolovie (2010), this high-order correlational research design examines the relationship between one dependent variable and two or more independent variables

Population of the study and sampling Technique

The population of the study was secondary school students in class three in 16 public secondary schools in Obio-Akpor LGA of Rivers State Nigeria. A sample of 102 was drawn using disproportionate stratified random sampling based on gender.

Instrument for Data Collection

An instrument package containing three instruments was used for data collection. There were two sections labelled A and B in the instrument package. The purpose of the instrument's section A was to gather demographic data from the respondents, such as their gender, age, and so on. There were three parts in Section B. Part A focused on ascertaining the academic performance of students using a researcher-developed mathematics performance test (MPT). This test contained mathematics test questions. It was designed using the multiple-choice question format with four options lettered A, B, C, and D, which has a key (correct response) and three distractors (incorrect response. The second instrument was an adapted Emotional Intelligence Appraisal that was based on Goleman‘s model of Intelligence. This instrument was designed to assess students‘ emotional intelligence. The items assessed the four key elements of Daniel Goleman's model of emotional intelligence. High scores show that an individual has high emotional intelligence and low scores show low emotional intelligence. The third instrument was the adapted 12-item Grit scale by Duckworth & Quinn (2009). This section assessed the grit of the respondents. This section's design was based on a five-point

scale of very much like me, Mostly like me, Somewhat like me, Not much like, and Not like me at all. The responses are assigned 5,4,3,2 and 1 as scoring for positively stated items and the reverse for negative items. High scores show that an individual is gritty, while low scores show otherwise.

Validity and Reliability of the Instruments

Although, the adapted instruments have been validated by the developers of the instruments from whom they were adapted, validity and reliability were re-established to suit the current study. To ascertain the face and content validity of the instrument, draft copies of the instruments were given to experts in measurement and evaluation and educational psychology alongside the research questions and hypothesis of the study. This was done to assess the instrument's content, usefulness, thoroughness, clarity, and literacy requirements. Their comments and corrections were incorporated into the instrument's final version. The Mathematics performance test face and content validity were established using the judgment of experts in measurement and evaluation, mathematics subject specialists, and instructional designers. The Cronbach alpha method of internal consistency was used to estimate the instruments' reliability and construct validity. On a sample of 30 respondents, these instruments were pilot-tested. Each item on the test was evaluated for quality and selection by the Cronbach alpha method. Based on the inter-item analysis and item-total statistics, items were included in the final instrument, for Emotional intelligence, .705, was obtained, for the Grit Scale, a Cronbach Alpha reliability of .762 was obtained while For Mathematics Performance Test, a Split half reliability of .62 was obtained

Method of Data Analysis

Beta values, simple and multiple regressions, ANOVA associated with multiple regression, and t-test associated with simple regression were used to analyze the data. At 0.05 level of significance, each hypothesis was tested.

Results

Research Question One: To what extent does grit predict the academic performance of students?

Table 1: Simple Regression Analysis of the prediction of grit on academic performance of students

R	R Square	Adjusted R Square
.065	.004	.006

According to the result shown in Table 1, a simple linear regression R-value of 0.065 was obtained with an R^2 value of 0.004 and an adjusted R^2 of 0.006 when grit was used to predict the academic performance of students. This table shows an R of.0065 which shows that there is a low positive relationship between grit and academic performance. An R change of.004 means that 0.4% of the proportion of variation in academic performance can be explained, accounted, or attributed to grit.

Hypothesis One: Grit does not have any significant prediction on the academic performance of students.

Table 2: T-test associated with Simple regression Analysis of the prediction of grit on academic performance of students

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**T**	**Sig.**
Grit	.020	.030	.065	.651	.516

Table 2, shows a beta of 0.065, a t-value of .651, and a sig of. 516. B = .065, t = .651 which was not significant at 0.05 alpha level, t= .651, p=.516 (p > .005). The null hypothesis of grit not having any significant prediction on the academic performance of students is therefore accepted and the alternate rejected. This result indicates that grit does not have a significant prediction on the academic performance of secondary school students.

Research Question Two: To what extent does emotional intelligence predict the academic performance of students?

Table 3: Simple Regression Analysis of the prediction of emotional intelligence on academic performance of students

R	R Square	Adjusted R Square
.266	.071	.061

According to the result shown in Table 2, a simple linear regression R-value of 0.266 was obtained with an R^2 value of 0.071 and an adjusted R^2 of 0.061 when emotional intelligence was used to predict the academic performance of students. This table shows an R of.266 which shows that there is a relationship between emotional intelligence and academic performance. An R change of.071 means that 7.1% of the proportion of variation in academic performance can be explained, accounted or attributed to emotional intelligence.

Hypothesis Two: Emotional intelligence does not have any significant prediction on the academic performance of students.

Table 4: T-test associated with Simple regression Analysis of the prediction of emotional intelligence on academic performance of students

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	**Std. Error**	**Beta**	**T**	**Sig.**
EI	.156	.057	.266	2.759	.007

Table 4, shows a beta of 0.266, a t-value of 2.759, and a sig of. 007. B = .266, t = 2.759 which was significant at 0.05 alpha level, t= 2.759, p=.007 (p < .005). The null hypothesis of emotional intelligence not having any significant prediction on the academic performance of students is therefore rejected and the alternate accepted. This result indicates that emotional

intelligence has a significant prediction on the academic performance of students.

Research Question Three: To what extent do grit and emotional intelligence jointly predict the academic performance of students?

Table 5: Multiple Regression Analysis of the joint prediction of Grit and Emotional Intelligence on academic performance of students

R	R Square	Adjusted R Square
.327	.107	.089

According to the result shown in Table 1, a simple linear regression R-value of 0.327 was obtained with a R value of 0.107. An adjusted R of 0.089 was obtained when grit and emotional intelligence were jointly used to predict the academic performance of students. This table shows an R of.327 which shows that there is a relationship between grit and emotional intelligence and academic performance. An R change of.101 which means that 10.7% of the proportion of variation in academic performance can be explained, accounted or attributed to grit and emotional intelligence.

Hypothesis Three Grit and emotional intelligence do not have any significant prediction on the academic performance of

Table 6: ANOVA Associated with Multiple regression analysis of the joint prediction of grit and emotional intelligence of academic performance of students

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	359.191	2	179.595	5.916	.004
	Residual	3005.633	99	30.360		
	Total	3364.824	101			

ANOVA associated with multiple regression as shown in Table 6 reveals that F – value of 5.916 (2,99), p 004 < 05. Therefore, the null hypothesis that grit and emotional intelligence jointly do not have any significant prediction on the academic performance of students is rejected and the alternate accepted. This implies that grit and emotional intelligence jointly significantly predict the academic performance of students.

Discussion of Findings

The analysis of the data reveals a weak relationship between grit and academic performance among secondary school students, with grit not emerging as a significant predictor of academic success. This is in consonant with the findings of Bazelais et al. (2018), Chang, (2014), Gruenberg et al. (2018) Huhn et al (2021) Jaeger et al (2010), Nelson (2016) and Palisoc et al.2017. This is however not in tandem with the findings of Bowman et al (2015), Cross (2013), Datu et al (2018), Gat et al (2021), and Mamah (2022). Possible reasons for this divergent finding could be due to differences in the sample demographics, measurement

instruments, and area of the study. This result could be due to many reasons. Firstly, the multifactorial nature of academic performance suggests that while grit is important for perseverance and long-term goal achievement, its influence may be overshadowed by other more significant predictors. Academic success is influenced by various factors such as intelligence, motivation, socioeconomic status, and family support, all of which may have a stronger impact on academic performance than grit alone. Measurement limitations also play a role in understanding the relationship between grit and academic performance. Grit is typically measured using self-report surveys, which may introduce bias and measurement error. Additionally, the broad construct of grit, encompassing both perseverance and passion for long-term goals, makes it challenging to accurately capture its effects on academic outcomes. The complexity of academic tasks further complicates the relationship between grit and academic performance. While grit may contribute to persistence in completing assignments, it may not directly influence the mastery of cognitive skills required for high academic achievement, such as critical thinking and problem-solving. Furthermore, developmental differences among students may affect the relevance of grit to academic success. Grit may be more relevant for older students or individuals pursuing long-term goals, while its impact may be less pronounced among younger students whose academic tasks are less demanding. While grit is an important trait associated with perseverance and achievement in various domains, its weak relationship with academic performance suggests that it may not be a significant predictor of academic success among secondary school students.

The result also revealed a positive relationship between emotional intelligence (EI) and academic performance among secondary school students. The correlation coefficient (r) of 0.266 indicates a moderate positive association between these variables. One notable result is the R-squared change of 0.071, indicating that approximately 7.1% of the variation in academic performance can be attributed to emotional intelligence. This suggests that while emotional intelligence is a meaningful predictor of academic success, it accounts for only a modest proportion of the variability observed in academic performance among students. Furthermore, the statistical significance of the relationship between emotional intelligence and academic performance, as indicated by the p-value being less than 0.05, provides additional support for the importance of emotional intelligence in predicting academic outcomes. This implies that emotional intelligence is not merely coincidental, but has a genuine influence on students' academic performance. This finding aligns with previous research suggesting that emotional intelligence play a significant role in shaping students' academic performance and outcomes **(**Ali & Mohamad 2020; Amalu, 2018; Barchard, 2003; Banat & Rimawi 2014; Estrada et al 2021; Prabha, 2015; Omenen, 2015; Bakhshi, et al., 2016; Herut et al 2023; Karimi et al 2020; Meyer et al.,2021 MacCannan et al 2020; Nwadinigwe, & Azuka-Obieke 2012; Parker, et al.2004; Parker, et al.2005: Parker, et al.2005 &Taseer et al 2023). Though Mohzan et al (2013) and Huhn et al (2021) research findings did not reveal that there is a correlation between emotional intelligence and academic ability**.** This divergent result could be a result of a difference in the demographics of the studies Several reasons can be posited to explain why emotional intelligence emerges as a significant predictor of academic performance in this study. Firstly, students with high emotional intelligence are often adept at managing stress and regulating their emotions, which can

enhance their ability to focus, study effectively, and perform well academically. Moreover, emotional intelligence encompasses interpersonal skills such as empathy and communication, which contribute to positive relationships with teachers, peers, and parents. These relationships can provide valuable support and resources for academic success, creating a conducive learning environment for students. Additionally, high emotional intelligence is associated with greater resilience and adaptability, enabling students to bounce back from setbacks, persevere in the face of challenges, and make wise decisions regarding their academic goals and strategies. Furthermore, emotionally intelligent students are regularly intrinsically motivated, setting meaningful academic goals and persisting in their efforts to achieve them. This intrinsic motivation fosters a sense of purpose and engagement in learning, contributing to improved academic outcomes.

This is the finding, that essentially underscores the importance of emotional intelligence in predicting academic performance among secondary school students. However, it is essential to acknowledge that emotional intelligence is just one of many factors influencing academic success. Future research could explore how interventions targeting emotional intelligence skills can be effectively integrated into educational practices to support students' holistic development and academic achievement.

The analysis reveals a significant prediction of both grit and Emotional Intelligence (EI) jointly on academic performance among secondary school students. This is somewhat in alignment with the findings of Ain, et al., (2021), Eteng-Uket & Njaka (2023), Hamilton, (2020), Zer, (2021), and Resnik, et al., (2021). Their studies on grit and emotional intelligence have been able to establish a connection between these two factors, but not about academic performance. As earlier mentioned, studies on Grit and EI predictions of academic performance are almost non-existent. This research finding therefore presents a significant report in this area.

This joint significance suggests that the combination of grit and EI serves as a robust predictor of academic success. Several key factors contribute to this finding. Grit and EI encompass distinct but complementary skill sets that are conducive to academic success in mathematics. Grit reflects individuals' perseverance and passion for long-term goals, while EI encompasses abilities such as self-awareness, self-regulation, empathy, and social skills. Together, these traits create a comprehensive framework for students to effectively navigate mathematical challenges, manage stress, and persist in their efforts to achieve academic success. Also, mathematics requires complex problem-solving skills, critical thinking, and adaptability. Grit enables students to persevere through challenging mathematical tasks and setbacks. EI equips students with effective problem-solving strategies, such as self-awareness to recognize when they are struggling, self-regulation to manage frustration, and social skills to seek help and collaborate with peers. The combination of grit and EI enhances students' ability to tackle mathematical problems creatively and persistently, leading to improved academic performance.

Furthermore, academic success in mathematics often involves facing setbacks, making mistakes, and learning from failures. Grit fosters resilience by encouraging students to persevere through difficulties and setbacks, while EI helps them regulate their emotions and maintain a positive attitude towards learning. Students with high levels of both grit and EI are resilient in the face of challenges, bouncing back from failures, seeking assistance when

needed, and persisting in their efforts to master mathematical concepts and skills. Mathematics learning frequently involves collaborative problem-solving and communication of mathematical ideas. EI facilitates effective communication, empathy, and collaboration among students, enabling them to work productively in groups, share ideas, and seek assistance from peers or teachers. Grit motivates students to actively engage in collaborative learning experiences, persevere through group challenges, and contribute positively to team dynamics, ultimately enhancing their mathematical proficiency and academic performance. Additionally, Both grit and EI are associated with intrinsic motivation—the internal drive to pursue goals for personal satisfaction rather than external rewards. Grit motivates students to set and work towards challenging mathematical goals with determination and perseverance, while EI helps them set realistic goals, monitor their progress, and adapt their strategies as needed. The combination of grit and EI fosters a sense of purpose and commitment to academic excellence, driving students to achieve their mathematical aspirations and succeed academically.

The joint significance of grit and Emotional Intelligence in predicting academic performance in mathematics underscores the importance of integrating these complementary traits in mathematics education. By fostering grit and EI skills among secondary school students, educators can empower students to overcome mathematical challenges, develop effective problem-solving strategies, and persist in their pursuit of mathematical excellence, ultimately leading to improved academic outcomes in mathematics.

Conclusion

Based on the findings reveal a significant positive relationship between grit and Emotional Intelligence (EI) in predicting academic performance in mathematics among secondary school students. These two constructs play crucial roles in shaping students' success in mathematical education. This significant relationship underscores the importance of integrating both grit and EI development into mathematics education. Grit, with its emphasis on perseverance and long-term goal pursuit, complements EI's focus on self-awareness, self-regulation, empathy, and social skills. Together, they provide students with a robust toolkit to navigate mathematical challenges effectively, manage stress, and persist in their efforts to achieve academic success. Furthermore, recognizing the joint significance of grit and EI offers valuable insights for educators, policymakers, and stakeholders in education. By fostering these traits among secondary school students, educators can create supportive learning environments that empower students to overcome mathematical obstacles, develop effective problem-solving strategies, and cultivate a positive attitude toward learning mathematics.

In conclusion, the joint significance of grit and Emotional Intelligence in predicting academic performance in mathematics highlights the importance of holistic approaches to mathematics education. By incorporating both grit and EI development into educational practices, stakeholders can enhance students' mathematical proficiency, promote academic success, and prepare them for future challenges in mathematics and beyond.

Recommendation

Based on the findings, the following recommendations are made;

Educators should incorporate both grit and EI development into mathematics curricula to enhance students' problem-solving skills, resilience, and self-awareness.

Psychometricians and Test Developers should develop and validate assessment tools that accurately measure grit, emotional intelligence, and mathematics academic performance across diverse populations. Ensure that these measures are reliable and culturally sensitive to provide meaningful insights into students' abilities and strengths.

Instructional Technologists should develop educational technology tools that explicitly target the development of grit and emotional intelligence skills. Incorporate gamification and interactive features to engage students in activities that promote perseverance, self-awareness, and social-emotional learning.

Educators should be provided or engaged in training on strategies to foster grit and EI in students in mathematics instruction, such as promoting perseverance and encouraging collaboration.

Counsellors should guide the development of grit and emotional intelligence skills in students.

Also, there should be a collaboration between measurement experts, instructional designers, and school counsellors to design effective interventions and assessment tools that promote the simultaneous development of grit and EI in mathematics education.

Continuously evaluating and refining educational practices to ensure they effectively cultivate both grit and EI skills, ultimately enhancing students' mathematical proficiency and academic performance

Limitations and Suggestions for further studies

Limitations of these findings may include the reliance on self-reported measures for assessing grit and Emotional Intelligence (EI), which could introduce bias and measurement error. Additionally, the study's focus on secondary school students from a specific demographic may limit the generalizability of the findings to other populations or educational contexts. Suggestions for further studies could involve longitudinal designs to examine the long-term effects of grit and EI on academic performance in mathematics. Future research could also explore potential moderators and mediators of the relationship between these constructs, as well as investigate the effectiveness of interventions aimed at fostering grit and EI skills, specifically in mathematics education. Finally, employing mixed-methods approaches could offer a more comprehensive understanding of the interplay between grit, Emotional Intelligence, and academic performance in mathematics.

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