

Grit And Emotional Intelligence as Correlates of Academic Achievement of Chemistry Students in Secondary Schools in Anambra State, Nigeria

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Abstract

The need to ascertain and determine Chemistry students' academic success in secondary schools necessitated this study which is Grit and Emotional Intelligence as correlates of academic achievement of chemistry students in secondary schools in Anambra State. Three research questions guided the study and three hypotheses were tested at 0.05 level of significance. The study employed a correlational research design. The sample consisted of 200 SS3 Chemistry students selected from ten secondary schools from Awka and Onitsha Education Zones of Anambra State. Three instruments were used for data collection and they include Grit scale, Emotional Quotient Inventory and students SS2 chemistry academic records/grades. The grit scale and emotional quotient inventory were validated by two science education lecturers and one expert from measurement and evaluation to know if it is suitable for Chemistry students in Nigeria and the reliability coefficients of these instruments was 0.83 and 0.89 respectively using Cronbach Alpha technique. Data were analyzed using regression analysis and Analysis of Variance (ANOVA). The findings reveal that there exist a moderate positive relationship between grit and academic achievement of students in Chemistry and also a moderate positive relationship between emotional intelligence and academic achievement of students in chemistry in Awka and Onitsha Education Zones of Anambra State. There was a joint significant relationship between grit, emotional intelligence and academic achievement of students in chemistry in the two zones. It was recommended among others that teachers and school counselors should guide students in developing their grit and emotional intelligence since they are associated with academic success

Keywords: *Grit, Emotional Intelligence, Academic Success, Academic Achievement, Chemistry students*

I. Introduction

Chemistry is a branch of pure science which basically deals with the properties, compositions and uses of matter. Chemistry education has been identified to be one of major bedrock for the national transformation of our national economy (Egolum & Igboanugo, 2022). Chemistry addresses the needs of majority through its relevance and functionality in content, practice and application (Egolum & Njelita, 2019). Despite the importance of chemistry in national development, the Waec chief examiners report of 2020-2023 indicated that the performance of students in West African School Certification Examination (WASSCE) in chemistry in

Awka and Onitsha Education Zones and Nigeria generally has not been impressive and thus poses problems on chemistry students' academic success.

Academic success is a long-term goal full of difficulties that require students to denote time as well as regulate themselves to conquer challenges. Academic success depends on a magnitude of interrelated factors and cannot be attributed to merely one factor. To preserve and certify learner's academic success, some researchers are seeking for other ways to ascertain and determine student's success not only on their cognitive traits but also their non-cognitive traits as well (Jiaze & Yang, 2021). Such non-cognitive traits include Grit and Emotional Intelligence.

Grit is described as students' passion and persistent in achieving long-term and meaningful goals. Grit is a positive non-cognitive trait based on a person's perseverance of effort combined with their passion for a particular long-term goal or end state- a powerful motivation to achieve an objective (Ira, 2023). This perseverance effort helps people overcome obstacles or challenges to accomplishment and drives people to achieve. Duckworth (2016) defined grit as passion and perseverance for long-term goals. To Vaughn (2023), grit is a combination of passion and perseverance in an effort to achieve long-term goals. Five characteristics that can be found in most gritty individuals include passion, perseverance, courage, resilience and conscientiousness (Vaughn, 2023). Without passion, perseverance leads to burn out and without perseverance, we simply give up. For students to develop the characteristics of grit for themselves, they should be able to manage their distractions, eradicate their fixed mindsets, confront their fears of failure and improve their academic success. Teachers who encourage grit can help their students achieve their learning goals by motivating them to try hard and persevere in this process (Huescar et al, 2020). For gritty students, obstacles and challenges serves as opportunities for learning and helps them to be more persistent and attentive in the face of difficulties and thus make their emotions stronger.

Emotional Intelligence (E.I.) also called Emotional Quotient (E.Q.) is the ability to identify and manage both your emotions and the emotions of the people you interact with. . Herrity (2023) sees emotional intelligence as a necessary skill for navigating important relationships in one's life. Emotional intelligence is the ability to perceive, manage and regulate emotions, promoting adaptive thinking and the understanding of the meaning and consequences of emotions (Lozano-Blasco, 2023). This process of management, regulation and adaptation allows the person to develop intellectually. Research studies attest that both ability and trait measures of emotional intelligence relate to academic success (Cherkowski *et al*, 2021; England & Nagel, 2022). Understanding and managing emotions are clearly linked with academic achievement with the strongest relationship for emotional understanding (Costa & Faria, 2020; Romano *et al*, 2020). According to Waheed & Ghazal (2020), there are several possible pathways by which emotional intelligence may influence academic achievement and they includes

1. Students who can regulate their negative emotions may be less impaired by negative emotions in assessment and learning situations
2. Academic success required not just passing test but also requires collaboration in the form of group projects and presentations
3. The ability to make connections and maintain social relationships may be important not only for gaining high grades on group assessment but more generally for maintaining social support and well-being in the educational environment

Thus emotional intelligence and grit works as a predictor of academic achievement. Many studies showed that students with excellent academic achievement have most stable emotional intelligence. The other groups of students with low level of academic achievement show lower level of emotional intelligence (Satuf *et al*, 2020; Li *et al*, 2021). Lozana-Blasco, (2023) opined that emotional intelligence is a valuable variable to predict academic achievement of students. Also Duckworth et al, (2009) found out that students who possess higher grit can achieve optimal academic result. The higher the students grit, the higher their academic achievement

Grit and emotional intelligence form a powerful framework for understanding and predicting academic success but the interplay between them and academic achievement are understudied in chemistry particularly within the context of secondary schools in Awka and Onitsha Education Zones of Anambra state. Therefore the researchers embarked on this study

Research Questions

The following research questions guided this study

1. What is the relationship between grit and academic achievement of chemistry students in secondary schools in Awka and Onitsha Education Zones?
2. What is the relationship between emotional intelligence and academic achievement of chemistry students in secondary schools in Awka and Onitsha Education Zones?

3. What is the joint relationship between grit, emotional intelligence and academic achievement of chemistry students in secondary schools in Awka and Onitsha Education Zones?

Hypotheses

The following hypotheses for the study were tested at 0.05 level of significance

1. There is no significant relationship between grit and academic achievement of chemistry students in secondary schools in Awka and Onitsha Education Zones.
2. There is no significant relationship between emotional intelligence and academic achievement of chemistry students in secondary schools in Awka and Onitsha Education Zones.
3. There is no significant joint relationship between grit, emotional intelligence and academic achievement of chemistry students in secondary schools in Awka and Onitsha Education Zones.

II. Methods

A correlational research design was used to investigate the relationships between variables in the study. The study was carried out in the 91 government owned secondary schools in Awka and Onitsha education zones of Anambra state. The sample used for the study comprised 200 SS3 Chemistry students selected from ten secondary schools in the two zones used for the study. Six secondary schools were selected from Awka education zone with higher number of schools while four schools were selected from Onitsha education zone. The ten schools were selected by purposive sampling technique. 20 students were selected by simple random sampling in each of the ten schools selected for the study making it a total of 200 SS3 students

Three instruments were used for data collection and they includes

1. 12-item Grit Scale (GS) developed by Duckworth et al, 2007
2. Emotional Quotient Inventory (EQI) developed by Malina, 2011
3. Students academic records/ grades

The 12-item grit scale was rated on a 5-point Likert scale of Very Much Like Me (VMLM) = 5 points, Mostly Like Me (MLM) = 4 points, Somewhat Like Me (SLM) = 3 points, Not Much Like Me (NMLM) = 2 points and Not Like Me At all (NLMA) = 1 point. The 10-item emotional quotient inventory was rated on a 4-point scale of Strongly Agree (SA) = 4-points, Agree (A) = 3-points, Disagree (D) = 2-points and Strongly Disagree (SD) = 1-point. This was used to measure the emotional intelligence/quotient of the chemistry students. The academic records of the students used was their SS2 annual result

The grit and emotional quotient inventory was face validated by experts in science education and measurement and evaluation to ensure it is suitable for our students and modification was done on the original version of EQI to adapt its items to the standard of Nigerian students. The reliability of GS and EQI was determined using Cronbach Alpha technique and the reliability coefficients obtained was 0.83 and 0.89 respectively. The data obtained were analyzed using regression analysis to answer the research questions and Analysis of Variance (ANOVA) was used to test the hypotheses at 0.05 level of significance. The interpretation is as follows: A score of .80 and above is considered a high relationship, .31- .79 is considered a moderate relationship while .30 and below is considered a low relationship.

III. Results

The results are presented in tables

Table 1: Regression analysis of the relationship between grit and academic achievement of Chemistry students in secondary schools in Awka and Onitsha Education Zones

Model	R	r ²	Adjusted r ²	Standard error of the estimate	Decision
1	.304 ^a	.092	.088	7.03432	Moderate positive relationship

R= Correlation coefficient

r² = Coefficient of determination

a = predictors

Data in table 1 indicates that there exist a moderate positive relationship between grit and academic achievement of Chemistry students in Awka and Onitsha Education Zones. The correlation coefficient between grit and the Chemistry students academic achievement is .304 and the coefficient of determination (r²) associated with the correlation is .092. This indicates that the 9.2% variation in secondary students' academic achievement in chemistry can be attributed to their grit.

Table 2: ANOVA Regression analysis of the significant relationship between grit and academic achievement of Chemistry students in secondary schools in Awka and Onitsha Education Zones

Model		Sum of Squares	df	Mean Squares	F	Sig.
1	Regression	996.025	1	996.025	20.129	.000
	Residual	9797.370	198	49.48		
	Total	10793.395	199			

The results in table 2 shows that at 20.129 F-value, the probability value of .000 was obtained and this is less than 0.05 level of significance. Therefore the null hypothesis was rejected and there is a significant relationship ($p < 0.05$) between grit and academic achievement of Chemistry students used for the study

Table 3: Regression analysis of the relationship between emotional intelligence (EI) and academic achievement of Chemistry students in secondary schools in Awka an Onitsha Education Zones

Model	R	r ²	Adjusted r ²	Standard error of the estimate	Decision
1	.384 ^a	.147	.143	6.81756	Moderate Positive Relationship

Data in table 3 shows that the correlation coefficient between EI and academic achievement of chemistry students in secondary schools in Awka and Onitsha education zones was .384 indicating moderate positive relationship. The coefficient of determination was .147 indicating 14.7% variations

Table 4: ANOVA Regression analysis of the significant relationship between EI and academic achievement of chemistry students

Model		Sum of Squares	df	Mean Squares	F	Sig.
1	Regression	1590.537	1	1590.537	34.220	.000 ^b
	Residual	9202.858	198	46.479		
	Total	10793.395	199			

Results in table 4 indicate that at 34.220 F-value, the probability value of .000 was obtained which is less than 0.05 level of significance. Therefore the hypothesis was rejected and there is a significant relationship ($p < 0.05$) between EI and academic achievement of students in chemistry in Awka and Onitsha education zones

Table 5: Regression analysis of the joint relationship between grit and EI on academic achievement of students in chemistry in secondary schools

Model	R	r ²	Adjusted r ²	Standard error of the estimate	Decision
1	.433 ^a	.188	.180	8.67053	Moderate Positive Relationship

Table 5 results shows that the correlation coefficient between grit and EI on academic achievement of students in chemistry is .433 and the coefficient of determination (r^2) associated with the correlation coefficient is .188 meaning that 18.8% variation in chemistry can be attributed to the students grit and EI.

Table 6: ANOVA Regression analysis of the significant relationship between grit and EI on academic achievement of students in chemistry

Model		Sum of Squares	df	Mean Squares	F	Sig.
1	Regression	2027.699	2	1013.850	22.785	.000 ^b
	Residual	8765.696	197	44.496		
	Total	10793.395	199			

Results in table 6 shows that at F-value 22.785, the probability value of .000 was obtained and this is less than 0.05 level of significance. The hypothesis was rejected and thus there is a significant relationship ($p = 0.05$) between grit and EI on academic achievement of students in chemistry in Awka and Onitsha education zones

IV. Discussion

Results from the analysis shows that there is a moderate positive relationship between grit and academic achievement of students in chemistry in secondary schools in Awka and Onitsha education zones of Anambra state. Thus 9.2% variation in secondary school academic achievement can be attributed to grit. Also there is a significant relationship between grit and academic achievement of chemistry students in secondary schools in Awka and Onitsha education zones. This implies that an increase in students' grit led to a significant increase in their academic achievement in Chemistry. This is in agreement with the findings of Oluoch & Ireri (2024) that opined there was a significant positive correlation between grit and Chemistry student's achievement. Also Mamah *et al* (2022) found out that grit significantly predict academic achievement in science. This indicates that students' academic achievement in science increases when they have high grit for science learning.

Findings of the study revealed that there is a moderate positive relationship between emotional intelligence and academic achievement of Chemistry students used for the study and the relationship is significant. Emotional intelligence accounted for 14.7% variance of student's academic achievement in Chemistry. This implies that an increase in student's emotional intelligence led to a significant increase in their achievement in Chemistry. This is in agreement with the findings of Umate, Ibrahim & Abubakar (2023) that emotional intelligence is positively related to students' academic achievement in Chemistry. Also Anekwe, Opara & Nnorom (2024) opined that emotional intelligence is a significant predictor of students' achievement in stoichiometry in Chemistry.

The result of the study also shows that a moderate and positive relationship exist between grit, emotional intelligence and academic achievement of secondary school Chemistry students in Awka and Onitsha education zones. Grit and emotional intelligence jointly accounted for 18.8% variance in students' academic achievement in chemistry. There was a significance relationship between grit and emotional intelligence on academic achievement of students in chemistry. This implies that an increase in students' grit and emotional intelligence led to a significant increase in their academic achievement in Chemistry, thus grit and emotional intelligence helps predict student's achievement in Chemistry. This is in agreement with the findings of Eteng-Uket & Ezeoguine (2024) who also found out that grit and emotional intelligence jointly significantly predict academic performance in mathematics.

V. Conclusion

The findings of the study shows that grit and emotional intelligence plays crucial roles in shaping students success in chemistry and so should be incorporated in the teaching of chemistry. This is because together they provide students with a robust toolkit that is necessary to navigate challenges effectively manage stress and persist with efforts to achieve academic success. This will help to develop Chemistry student's problem-solving skills and help them develop positive attitude towards the learning of Chemistry thereby helping them improve academic outcomes in Chemistry and other sciences.

VI. Recommendations

1. Chemistry teachers and school counselors should guide students in the development of grit and emotional intelligence since they are associated with academic success
2. Workshops, seminars and webinars should periodically be organized to train chemistry teachers on strategies to foster grit and emotional intelligence in chemistry students during instructions
3. There should be collaboration between experts in instructional designs and school counselors to design effective interventions and assessment tools that promote the simultaneous development of grit and emotional intelligence for teachers of Chemistry in secondary schools
4. Chemistry teachers should try to assist learners to endure when experiencing difficulties and work on objectives of creating character qualities like grit and emotional intelligence in secondary schools

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Ethical Standard:

The students voluntarily agreed to be used for the study on the conditions that the data gathered will be kept with utmost confidentiality.

The students were selected based on their grade level and willingness to contribute to the research ensuring ethical standards were uphold during the study