The Relationship between Growth Mindset, Grit, and Academic Achievement: Does Goal Commitment Matter?

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Abstract
This present study's consisted of Ghanaian junior high school adolescents, precisely JHS1 and JHS 2. The study duration spanned from January 2019 to October 2020. During the study period, two assessments were done. In the first assessment, primary six students consisting of 425 adolescents, were assessed from 35 schools. During the year 2019, students in primary six who partook in the first assessment were engaged when they had been promoted to Junior high school. They included students who had become part of the classroom experiment. Eventually, this approach resulted in a sample size of 632 students for both JHS 1 and JHS 2. The data collection used structured questionnaires, and the snowballing approach was used for sampling and sample recruitment. The analytical method used for data analysis is structural equation modeling (SEM). This method is reliable for understanding the unique relationship between the dependent and independent variables to reveal their direct and indirect effects. This present study found that a growth mindset and grit are proportionally related to students' academic achievement. However, grit should be measured by the perseverance of effort, not consistency of interest and conscientiousness, to positively affect academic achievement. Both goal commitment and growth mindset are related to understanding how grit contributes positively to academic success. In essence, the findings imply that students need to have the perseverance to trigger their growth mindset and goal commitment to affect their academic pursuits positively.
Keywords: *Growth mindset; Grit; Academic achievement*

Introduction

The learning process is a gradual practice that involves an effort to persevere, especially in the face of difficulties and drawbacks (Binning et al., 2018). Latest evidence has shown that grit is a significant factor connected to student engagement and academic achievement, described as enthusiasm and determination in fulfilling long-term goals (Eskreis-Winkler et al., 2014; Duckworth & Quinn, 2009; Duckworth et al., 2007). In other words, learners who work extremely hard but still enjoy what they do are more capable of overcoming challenges and succeed well (Dweck et al., 2014). Notwithstanding the significant position of grit in formal learning in general and in Ghanaian culture, limited empirical research using a purposeful sampling technique has explored the mechanisms underlying grit among adolescents, particularly in the Ghanaian educational setting. As such, this research focuses on two psychological progenitors that are potentially guided (goal commitment and growth mindset), exploring whether, in academic learning, adolescents who have a growth mindset and high commitment to their educational objectives tend to be gritty.

Grit is linked to military turnover and performance, work environment, and classroom (Eskreis-Winkler et al., 2014; Duckworth and Quinn, 2009; Duckworth et al., 2007). In the educational setting, grit is correlated with academic achievement metrics, such as the existing grade point average of pupils (Muenks et al. 2018; 2017) and potential GPA in high schools (Duckworth & Quinn, 2009). The involvement of grit in academic success has recently been questioned due to only low and medium associations between these two factors and the considered detrimental validity of grit beyond and above conscientiousness and self-regulation (Muenks et al., 2017; Credé et al., 2017). One potential reason for these results is that, by aggregating two facet-level scores, most existing studies have employed an overall sum rating of grit (Guo et al., 2019 Credé et al., 2017).

Learners with a growth mentality are more likely to see difficulties and failures as learning opportunities; thus, they tend to show resilience and give greater attention to dealing with issues in the face of struggles. In turn, this commitment and focus contribute to academic achievement in school (Dweck et al., 2014). As a result, grit will serve as a mediator between academic achievement and engagement and growth mindset.

Research findings have shown that growth mindsets are closely related to academic achievement (Costa & Faria, 2018). In reality, initiatives (Yeager et al., 2016; Blackwell et al., 2007) have shown that their academic performance is increased by motivating students to adopt a growth mindset. Therefore, this association's primary issue tends to be that people with a growth mindset connect their accomplishments and setbacks to commitment and practice instead of ability (Dweck, 1986). This study intends to examine the degree to which grit serves as a mediating factor in the relationship between goal commitment, growth mindset, and academic achievement (engagement and Grade Point Average [GPA]).

Materials and Method

This present study's consisted of Ghanaian junior high school adolescents, precisely JHS1 and JHS 2. The study duration spanned from January 2019 to October 2020. During the study period, two assessments were done. In the first assessment, primary six students consisting of 425 adolescents, were assessed from 35 schools. The students' ages ranged from 12 to 13, and most of the students who participated in the study were females representing 54.8%. During the year 2019, students in primary six who partook in the first assessment were engaged when they had been promoted to Junior high school. They included students who had become part of the classroom experiment. Eventually, this approach resulted in a sample size of 632 students for both JHS 1 and JHS 2. Out of the total sample size, 55.4% were females in JHS1, and 56.4% were also females in JHS 2. In essence, females formed a majority of the participants of the study. The overall response rate was high but encountered some missing data. Specifically, the missing data were approximately 1.4% and 1.7% for JHS 1 and JHS 2, respectively. The data collection used structured questionnaires, and the period for answering the questionnaires was approximately one hour on average. Moreover, informed consent was issued to the respective authorities, and the questionnaires were carefully explained to the volunteers. The snowballing approach was used for sampling and sample recruitment.

A missing completely at random test (MCAR) proposed by Little (1988) was conducted to solve the missing data problem. Evidence from the test suggests that the data for each variable was not missing completely at random. Moreover, some form of attrition tests were performed to match the key variables regarding those who were dropped out based on their responses. In comparison, the students who participated in the study who were in Primary six, JHS 1, and JHS2 did not differ from those who participated. The number of students who participated was and those who stopped answering the questionnaires along with the study. The full information maximum likelihood estimation method was utilized to resolve the issues with missing data. More important, girls other than boys tend to have more engagement, perseverance of effort, and a good GPA (x^2= 5.01, p<0.05). (See table 1 for more details). The analytical method used for data analysis is structural equation modeling (SEM). This method is reliable for understanding the unique relationship between the dependent and independent variables to reveal their direct and indirect effects.

Table 1 Full information maximum likelihood estimation results

	X2	T-statistics	P-value
Primary six	0.01		0.95
Growth Mindset		1.18	0.22
Engagement		1.53	0.11
GPA		1.8	0.06
JHS1			
Goal commitment		1.22	0.21
Engagement		0.06	0.94
GPA		1.63	0.09
Consistency of interest		-0.41	0.66
Socio Economic status		1.44	0.14
academic persistence		1.64	0.09
conscientiousness		0.34	0.71
JHS2			
Perserverance of effort		2.02	<0.05
Engagement		2.26	<0.05
GPA		5.07	<0.01

Variables measurement

Growth mindset

Growth mindset assessments of students were done using six items adopted the measurements proposed by Blackwell et al. (2007). Blackwell et al. (2007) contend that it is unlikely to easily change people's intelligence, which depicts the diligence and conscientiousness of human capabilities that seemingly hard to change by an individual. The students were asked to consent to the questions asked on a scale of one (1) to five (5), where 5 = completely agree to 1 = completely disagree. Two items loaded satisfactorily and were later removed from the data in further analysis. Specifically, the four (4) left for the analysis were reversed to depict a growth mindset other than a fixed mindset. Therefore, questions with higher scores represented students with a growth mindset. The four items had a Cronbach alpha coefficient of 0.67, passing the good to a fitness test.

Grit

The grit measurements were adopted from Duckworth and Quinn (2009), where they utilized 8 items to measure that construct. Two latent variables measured grit: consistency of interest (CSI) and perseverance (PEF). 4 items measured both latent variables. The items were measured on a scale of 1 to 5 where 5 = completely agree to 1 = completely disagree. All the items loaded satisfactorily with a Cronbach alpha of 0.69 and 0.77 for consistency of interest and perseverance of effort, respectively.

Goal commitment (Educational context)

The measurement used by Little (1983) in the Personal Project Analysis Inventory was adopted. The measures focused on the educational context goal assessment of students personally. Initially, the students (participants) were instructed to put down their personal goals concerning education and school. Subsequently, an appraisal of their goals was done, and the specification of their goals toward their attitudes or behaviors was garnered (Flunger et al., 2016). Three items were used to measure goal commitment's overall construct on a 7-point Likert scale where 7 = very much and 1= not at all. The Cronbach alpha for the construct was 0.75.

Academic engagement and achievement

Measurement items for these constructs were adopted from Salmela-Aro and Upaday (2012). To be specific, latent variables measured academic engagement; thus, energy, dedication, and absorption were represented by one item each. Therefore, the overall items used to measure academic engagement was three (3). Three items were used to measure goal commitment's overall construct on a 7-point Likert scale where 7 = very much and 1= not at all. The Cronbach alpha for the construct was 0.94.

On the other hand, academic achievement was measured by the students' grade point averages and based on academic assessments.

Other variables (control variables)

Academic persistence, conscientiousness, socio-economic status, and gender were evaluated based on self-reporting items. In the course of the analysis, engagement, and academic achievement (GPA) were included as control variables. To assess the participants' socio-economic status, the students were asked to rate their parents' financial status on a scale of 5 where 5 = good to 1 = bad. Academic persistence was measured on a 7-point Likert scale (7 = Very true, 1 = not true at all) with three items (Niemivirta, 2020). Conscientiousness was measured on a five-point Likert scale (5 = completely agree, 1 = completely disagree) with two items. The Cronbach alpha for the three constructs were 0.80, 0.79, and 0.91, respectively.

Findings and discussion

Table 2 outlines the variables description and their indicators in the study. Also, it displays the descriptive statistics of the variables such as the mean, standard deviation, and the range or scale of measurement.

Table 2 Variable description and descriptive statistics

Indicator	Variable description	Mean	Standard Deviation	Range
GRM	Growth mindset	3.11	0.87	1–5
GCM	Goal commitment	5.78	0.94	1–7
CSI	Consistency of interest	3.18	0.73	1–5
PEF	Perserverance of effort	3.32	0.78	1–5
CON	conscientiousness	3.19	0.65	1–5
ACPR	Academic perseverance	4.56	1.4	1–7
SOES	Socio Economic status	3.98	0.97	1–5
GEN	Gender	1.44	0.49	1–2
JH1GPA	Junior High Student GPA	8.17	0.85	5–10
JH1ENG	Junior High student engagement	4.24	1.48	1–7
JH2GPA	Senior Hign Student GPA	8.22	1	5–10
JH2ENG	Senior high student engagement	4.31	1.47	1–7

Table 3 exhibits the correlation results of the variables. From the table, it can be reported that all the variables have a positive correlation with a growth mindset, but only perseverance of effort, academic perseverance, and academic achievement (JHS1GPA and JHS2GPA) are significantly correlated to a growth mindset.

Table 3 Correlation results

	GRM	GCM	CSI	PEF	CON	ACPR	SOES	GEN	JH1GPA	JH1ENG	JH2GPA	JH2ENG
GRM	1											
GCM	0.07	1										
CSI	0.08	0.07	1									
PEF	0.14**	0.30**	0.08	1								
CON	0.04	0.13	0.47**	0.29**	1							
ACPR	0.12**	0.11	0.51**	0.38**	0.44**	1						
SOES	0.04	0.27**	0.05	0.27**	0.04	0.13**	1					
GEN	0.01	-0.01	0.03	-0.02	0.01	0.07	0.09**	1				
JH1GPA	0.31***	0.17**	0.04	0.28**	0.13**	0.30**	0.05	-0.21**	1			
JH1ENG	0.08	0.31**	0.06	0.45**	0.18**	0.19**	0.12**	-0.01	0.19**	1		
JH2GPA	0.29***	0.12*	0.05	0.36**	0.17**	0.33**	0.09**	-0.20**	0.85**	0.19**	1	
JH2ENG	0.03	0.25**	0.10*	0.43**	0.16**	0.23**	0.17**	-0.05	0.17**	0.50**	0.25**	1

Note: *** indicates 1% significance level, ** indicates 5% significance level. * indicates 10% significance level.

In table 4, the structural equation modeling estimates are presented. From the results, the direct effect of growth mindset to the consistency of interest can be reported as insignificant as well as a growth mindset to the perseverance of effort and engagement as a result of academic achievement. However, it is evident that a growth mindset contributes positively to students' academic achievement regarding their grade point average ($\beta = 0.20$, p-value < 0.05). However, the indirect effect of growth mindset to academic achievement showed positive and significant effect on academic achievement on both variables (GPA: $\beta = 0.05$, p-value < 0.05; ENG: $\beta = 0.05$, p-value < 0.05).In light of the indirect effects, when a growth mindset is intervened by grit (consistency of interest), their academic achievement relationship is insignificant. Both the two variables used to measure academic achievement thus, GPA ($\beta = -0.01$, p-value > 0.1) and engagement (ENG) ($\beta = 0.01$, p-value > 0.1) insignificantly related to growth mindset (GRM) and consistency of interest (CSI). With regard to perseverance of effort as a measure of grit, a positive effect was established with its intervening role between growth mindset and academic achievement (GPA: $\beta = 0.05$, p-value = 0.05; ENG: $\beta = 0.05$, p-value = 0.05). For conscientiousness as a measure of grit, it is evident that growth mindset intervened by conscientiousness have no significant effect on academic achievement irrespective of GPA and engagement

(GPA: β = 0.01, p-value > 0.1; ENG: β = 0.01, p-value > 0.1). The overall effect of the growth mindset and grit suggests that they positively affect academic achievement when GPA is used as the measure but not engagement.

More importantly, the educational-related goal commitment was critically considered to understand the difference between the students' growth mindset. Despite that, the effects of goal commitment regarding their educational needs were modeled together with grit to ascertain the effects on academic achievement. In retrospect, the direct effect of goal commitment to grit variables revealed positive, but the consistency of interest showed an insignificant effect. Nevertheless, for the direct effect of goal commitment on academic achievement, the result showed insignificant effects on GPA and engagement. However, the indirect effect of goal commitment on academic achievement is positively significant. This implies that goal commitment can trigger academic success when it is backed by grit. To account for the grit measure's individual intervening effects, goal commitment intervened by the consistency of interest and conscientiousness has an insignificant effect on academic achievement. However, the perseverance of effort intervened between goal commitment and academic achievement are positively connected.

Meanwhile, goal commitment and grit's aggregate effect are positively connected to academic achievement, thus GPA and engagement. Moreover, male students tend to have goal commitment and growth mindset more than female students, which literally translate into higher academic achievements. Students' socio-economic status also positively influences goal commitment and growth mindset with the perseverance of effort and their GPA.

Table 4 Results from the structural equation modelling (direct, indirect, and aggregate effects)

	CSI	PEF	GPA	ENG
Growth Mindset				
Direct effect	0.09(0.07)	0.13(0.06)	0.20***(0.04)	0.04(0.06)
indirect effect			0.05**(0.02)	0.05**(0.03)
GRM -> CSI			-0.01(0.01)	0.01(0.02)
GRM -> PEF			0.02**(0.01)	0.04**(0.02)
GRM -> CON			0.01(0.00)	0.01(0.00)
Aggregate effect			0.26***(0.04)	0.1(0.06)
Goal Commitment				
Direct effect	0.09(0.06)	0.28***(0.06)	0.01(0.05)	0.012(0.08)
indirect effect			0.08***(0.02)	10***(0.02)
GCM -> CSI			-0.01(0.01)	0.01(0.02)
GCM -> PEF			0.05***(0.01)	0.09***(0.02)
GCM -> CON			0.02(0.01)	-0.1(0.00)
Aggregate effect			0.09*(0.04)	0.23***(0.08)
Covariates				
SOES	0.3(03)	0.20**(0.03)	0.03*(0.1)	0.05(0.05)
GEN	0.02(0.03)	0.01(0.03)	-0.03*(0.01)	-0.06(0.03)
JH1GPA	0.00(0.04)	0.016**(0.03)	0.80**(0.01)	0.01(0.04)
JH1ENG	0.03(0.05)	0.36**(0.04)	-0.01(0.01)	0.37**(0.04)

Note: *** indicates 1% significance level, ** indicates 5% significance level. * indicates 10% significance level.

Conclusion

This present study found that a growth mindset and grit are proportionally related to students' academic achievement. Nevertheless, grit should be measured by the perseverance of effort, not consistency of interest and conscientiousness, to positively affect academic achievement. Both goal commitment and growth mindset are related to understanding how grit contributes positively to academic success. In essence, the

findings imply that students need to have the perseverance of effort to trigger their growth mindset and goal commitment to affect their academic pursuits positively.

This study found that the grit-perseverance of effort had a slight but unusual influence on adolescents' academic achievement in schools in Ghana. Current grit findings on adolescents from Germany (Steinmayr et al., 2018) and the United States (Usher et al., 2018; Muenks et al., 2017) had shown that when prior motivation-related variables and academic achievement were established to have negative correlations between achievement and grit often, even though these results were not precise, likely differing as per the context. Park et al. (2018) obtained an adolescent sample from the U.S. in another recent study and found grit to impact academic achievement positively. In Ghana, this study's context was consistent with Finland, where the idea of sisu was highly regarded and established (Nylund, 2018; Duckworth, 2016). Adolescents having grown up in Ghana may be more likely to recognize the importance of perseverance and less likely to oppose it than their peers in other developing nations. Ghanaian students may also be more likely to convert into school-work their values and efforts of perseverance, thereby enhancing their academic achievement.

Due to its possible value for promoting positive adolescent development, grit has ignited enthusiasm and excitement from academicians and educators. Furthermore, because of its minimal and contradictory scientific findings, grit's academic performance involvement has recently been questioned, and researchers have advocated for further research across various contexts, developmental cycles, and academic performance. These results highlighted the advantage of grit in supporting students' academic performance and highlighted the need to perform grit studies in various contexts and concentrations.

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