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From Passive Learners to Active Participants: The Mediation Role of Student Agency in the Relationship between Mindset and Doctoral Success Among Ghanaian Doctoral Candidates

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ABSTRACT: Purpose: The purpose of this study was to examine the effect of mindset (MS) on the success (academic progression) of doctoral students in Ghana. It further delved into the mediation of role of student agency (SA) in the relationship between mindset and doctoral success.

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Design/methodology/approach: A correlational design with quantitative approach was used in this study. This study made use of primary data collected through a structured questionnaire. The data was collected from 390 PhD students from three public universities in Ghana. After data collection, the methods of analysis used were descriptive statistics, confirmatory factor analysis (CFA), and structural equation modelling (SEM).

Findings: The study revealed that mindset exert statistically significant positive direct effects on the success of doctoral students. Specifically, students who cultivate growth mindset rather than fixed mindset are more likely to succeed in their doctoral journey. Secondly, SA components (i.e., intentionality, motivation, self-regulation, and self-efficacy) partially mediates the effect of mindset on doctoral success. It implies that growth-oriented beliefs translate into academic progression both directly and indirectly.

Originality/value: This study empirically demonstrates that growth-oriented thinking alongside strong student agency practices significantly improve doctoral success. It offers practical guides for students, graduate schools and higher education policymakers in Ghana and other African countries to enhance academic progression of doctoral students.

Keywords: *Doctoral students, Student agency, Mindset, Structural equation modelling (SEM), Doctoral success, Mediation*

1. Introduction

Along the academic ladder when students arrive at the doctoral stage, (PhD education), there is a sharp shift from structured and instructor-led learning to more autonomous one (Cardoso, 2024; Adams et al., 2019). This transition places a greater responsibility for one's academic trajectory and further cultivates a proactive disposition toward learning as argued by Porter, (2020). An important aspect of this shift is the concept of student agency (SA). Student agency encompasses the capacity of learners to make informed choices, take initiative, and exert influence over their educational experiences. In this complex situation, the role of mindset cannot be overemphasized. The concept of mindset, particularly a growth mindset, could play a role in academic success at this stage. Growth mindset is one that fosters resilience, adaptability, and sustained motivation in the face of academic challenges whilst fixed mindset is the vice-versa. Among doctoral candidates in Ghana, the interplay between agency and mindset is especially pertinent, given the multifaceted

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systemic, cultural, and institutional barriers they often encounter. This paper examines the mediation role of student agency in the relationship between mindset and doctoral success in order to propose strategies for fostering these attributes within the higher education in Ghana. When doctoral students are well empowered to adopt an active, engaged stance toward their learning, universities would not only support academic progression but also nurture a generation of autonomous, resilient, and intellectually confident scholars.

In academia, doctoral education is challenging yet a transformative stage. Unlike undergraduate or master's programs, doctoral studies require students to independently design and execute research. They are demanded to contribute to knowledge creation, and navigate complex academic challenges which might not be experienced by undergraduate or master's students. Within Ghana for instance, PhD students face numerous challenges during their academic journey. These include financial constraints, difficulty accessing scholarly resources, and inadequate feedback from supervisors (Inusah & Agbenyega, 2021; Azila-Gbettor et al., 2015). They often struggle with managing supervisor relationships, data analysis, and theoretical frameworks (Attom, 2019). The extended duration of programs and limited conference funding opportunities further complicate their experiences (Inusah & Agbenyega, 2021). Many students report missing family and social connections, leading to feelings of isolation (Attom, 2019). Additionally, students' prior research knowledge is often insufficient for thesis writing (Yidaan, 2022).

Even though these academic challenges persists, existing studies in the Ghanaian and broader African doctoral education literature have largely focused on external constraints such as funding, supervision quality, and institutional capacity (Inusah & Agbenyega, 2021; Azila-Gbettor et al., 2015; Attom, 2019) while paying limited empirical attention to the state of students' mindset and student agency enable students to navigate these challenges successfully. There is a notable lack of integrated empirical evidence examining how student agency and mindset jointly shape doctoral success, and whether agency serves as a mechanism through which mindset translates into academic progression among Ghanaian doctoral students (Buchmann & Steinhoff, 2017; Marín et al., 2020; Brečko, 2024; Guo et al., 2024). Furthermore, most existing studies treat these constructs in isolation or within non-doctoral contexts, thereby overlooking their combined and context-specific influence within doctoral education systems in Ghana. There is the need to fill this

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gap to help shift the discourse from structural limitations to actionable student-centered capacities that can be strengthened within existing institutional frameworks.

This requires the cultivation of agency, which is considered an essential 21st-century learning skill for students, a concept that represents a goal and a process to guide and help learners navigate the unknown (Torres Castro & Pineda-Báez, 2023). Student agency, broadly defined, refer to the capacity of individuals to take ownership of their learning and actively engage in shaping their educational experiences. It involves setting goals, taking initiative, and persisting in the face of adversity in the educational journey. It has been established that student agency (SA) is a core component of professionalism (Stenalt, 2021). SA comprises employability skills (Mukhalipi & Shane, 2019), collaboration skills (Larsen et al., 2019), digital competences (Luo et al., 2019), and capacity for lifelong learning (Inouye et al., 2023).

There is empirical evidence that student agency has a significant impact on students' academic performance, cognitive development, and perceived learning experience (Buchmann & Steinhoff, 2017; Marín et al., 2020). Students who exhibit a sense of agency tend to take ownership of their learning, set meaningful goals, and engage more deeply with the educational content.

Research indicates that a growth mindset plays a significant role in academic performance across various educational levels. For doctoral students, a growth mindset is associated with improved academic outcomes (Brečko, 2024). This mindset, along with academic motivation, buoyancy, and self-efficacy, mediates the relationship between academic self-concept and performance in doctoral students (Guo et al., 2024). In the context of business education, a digital growth mindset positively influences academic performance, with a stronger effect observed in male students (Meng et al., 2024). The impact of growth mindset extends beyond doctoral education, as it has been shown to have direct and significant effects on university students' academic performance, alongside grit and academic self-efficacy (Correa-Rojas et al., 2024). Implicitly, promoting a growth mindset is important to enhance academic performance across different educational settings and levels. Thus, an assessment of the mediation role of student agency in the relationship between mindset and doctoral success is the key aim of this article.

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2. Theoretical and conceptual framework

This study is grounded on the Social Cognitive Theory (SCT). The SCT was put forth by (Bandura et al., 2006), and it states that agency is defined as the power to originate action (Bandura, 2001). At its core, agency within SCT is the inherent capacity of individuals to govern and direct their cognition, motivation, and behavior, guided by the influence of their self-beliefs, particularly the concept of self-efficacy (Bandura, 2001). SCT views human functioning through the lens of triadic reciprocal causation, a dynamic interplay among internal personal factors, behavioral patterns, and environmental influences. These factors are not viewed in isolation but are seen as mutually influencing and shaping each other bidirectionally (Bandura, 2001; Bandura et al., 2006). The concept of agency, within this theoretical framework, suggests that individuals are both products and producers of their social context, capable of influencing and being influenced by their surroundings (Bandura et al., 2006).

In SCT, various determinants, including behavioral, cognitive, and personal factors, along with environmental influences, are seen as causally linked and interacting with one another. While the regulation of personal processes is inherently an individual undertaking, it is not undertaken in isolation. Instead, it necessitates the mediating efforts of others and the broader sociocultural environment to foster goal-directed behaviour and development (Bandura, 2001). The self, conceived as an agent in SCT, is characterized by four fundamental features: intentionality, forethought, self-reactiveness (or self-regulation), and self-reflectiveness (or self-efficacy).

In the context of this study, SCT is linked to doctoral success since it provides the lens to analyse the dynamic interplay between individual, environmental, and behavioral factors. SCT, proposed by Albert Bandura, provides a robust foundation for exploring the subcategories of student agency, (like self-efficacy and social influences) making it particularly relevant for examining the success of doctoral candidates. SCT defines agency as "the power to originate action." In the doctoral context, agency encompasses a doctoral candidate's capacity to govern and direct their cognition, motivation, and behavior, guided by self-beliefs such as self-efficacy. SCT introduces the concept of triadic reciprocal causation, emphasizing dynamic and bidirectional interaction among internal personal

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factors, behavioral patterns, and environmental influences. This aligns with the intricate and evolving nature of doctoral candidates' experiences.

SCT places a significant emphasis on self-efficacy, which refers to an individual's belief in their capacity to succeed. In the doctoral context, self-efficacy influences goal setting, perseverance, and the ability to overcome challenges inherent in doctoral studies. SCT recognizes the role of environmental influences in shaping individual agency. Doctoral success is not solely an individual endeavor; it is influenced by the broader sociocultural context, including academic institutions, mentoring relationships, and collaborative research environments. SCT posits that individuals are both products and producers of their social context. In the doctoral journey, candidates contribute to and are influenced by their academic and research communities. Agency is also influenced by growth mindset theory (Dweck, 2006), which highlights the importance of believing in one's ability to improve through effort and persistence. Doctoral candidates with a growth mindset are more likely to embrace challenges and view setbacks as opportunities for growth, thereby enhancing their capacity for agency. In Ghanaian higher education, where traditional, teacher-centered learning practices dominate at lower levels of education, fostering student agency requires a deliberate shift in both pedagogical approaches and institutional culture.

3. Methodology

3.1 Study population and sampling strategy

Doctoral students in the public universities in Ghana constituted the population for this study. First, the universities were purposively sampled based on the following criteria: 1. Long-standing university established for not less than 60 years and therefore, has a long-standing reputation for academic research, and believed to have been able to largely overcome institutional challenges. 2. Accredited to run PhD programs across various disciplines.

Three publicly funded universities were selected for the study based on the above criteria. Their selection was deliberate since they had long-standing histories. They again have long-standing reputation for academic research. The university's Information and Communication Technology (ICT) unit facilitated the distribution of the online survey by sending it to all PhD students who were in their second year and above. Since there were approximately 13 parameters in each of the SEM models, the study relied on the widely

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cited rule of thumb advanced by Hair et al. (2010) to calculate the sample size. The Hair approach recommends a minimum ratio of 6 to 10 observations per estimated parameter in multivariate analysis. This criterion yields a baseline sample size range of 78 to 130 respondents. However, this study substantially exceeds this minimum threshold by employing a sample size of 390 respondents. This deliberate oversampling strengthens statistical power, improves the precision and stability of parameter estimates and generalizability of the results. The respondents were selected using convenient sampling technique. While convenience sampling often relies on readily available participants, the decision to include all second year and above PhD students mitigated potential biases associated with smaller, non-representative samples. This approach allowed for insights that are reflective of the broader academic community within the university, thus contributing to the overall rigor of the research. For this cross-sectional survey, data was collected using a survey questionnaire.

3.2 Measures for the study variables

The questionnaire items were based on research objectives that guided the study; here, subsequent hypotheses were formulated under key themes. Three different constructs were used in this study. They included student agency, mindset, and doctoral success. All questionnaire items/scales used in the process were derived from previous empirical research that were carried out by other researchers (see Table 1). The first part of the questionnaire captures the demographic data of the respondents. The subsequent parts comprise the themes in relation to the research questions, namely: student agency, mindset, and doctoral success. The section on student agency was measured on a 5-point Likert scale having five possible responses ranging from “does not correspond to (Number 1)”, to “corresponds exactly

Table 1: Summary of constructs, scales and usage in the analysis

Constructs	***Items Used***	***Scale***	***Usage in the analysis***	***Source***
Demographics	20	Not applicable	Each used individually as control variables in the structural equation model	Ghana Living Standard Survey and OECD
Student Agency (SA)				Agency for learning Questionnaire-
SA-Intentionality	8	Likert (1-5)	One composite variable from all four categories of SA items	

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Items				Short form
SA-Motivation Items	10	Likert (1-5)		
SA-Self-Regulation Items	5	Likert (1-5)		
SA-Self-Efficacy Items	5	Likert (1-5)		
Mindset	3	Likert (1-7)	Composite variable from all mindset items	Dweck's Growth Mindset Scale
Doctoral Success (Academic progress)	10	Likert (1-5)	Composite variable from all doctoral success items	Matheka, 2020

Source: Author's construct (2025)

(Number 5)". The last five items of the student agency, however, have responses ranging from: Not confident to (Number 1) to Extremely confident (Number 5). Mindset utilized a six-point Likert scale response that ranges from Strongly Agree (Number 1) to Strongly Disagree (Number 6), while the five-point Likert scale response of the Doctoral success section ranges from On Track (Number 1) Delayed by 4 years or more (Number 5). Likert response scale when employed, measures the strength or intensity of respondent's opinion. Jebb, Ng and Tay (2021) indicated that within the survey, the Likert Scale is used to ascertain whether a respondent concurs or disagrees with a certain statement or item pertaining to a research variable. A Likert scale is necessary since the researcher wants to learn people's ideas and attitudes in order to draw conclusions.

3.2.1 Student agency

Student agency was measured using the Agency for Learning Questionnaire–Short Form (AFLQ-SF) developed and validated by Code (2010). The AFLQ-SF assesses students' capacity to intentionally, motivationally, and self-regulatorily engage in their learning processes. The instrument consists of four theoretically grounded subscales: intentionality, motivation, self-regulation, and self-efficacy. Empirical evidence from prior studies demonstrates strong psychometric performance of the AFLQ-SF, including excellent internal consistency reliability (Cronbach's alpha values ranging from 0.79 to 0.89 across subscales), significant predictive validity for academic achievement even after controlling

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for prior performance, and a robust factor structure confirmed through confirmatory factor analysis. Further validation using item response theory indicates high item discrimination and good coverage across different levels of student agency (Code, 2020). In the present study, all retained items across the four subscales were combined to form a single composite latent construct representing overall student agency, which was modeled both as a direct predictor of doctoral success and as a mediating variable.

3.2.2 Mindset

Mindset was measured using Dweck's Growth Mindset Scale (Dweck et al., 1995; Dweck, 1999). The scale consists of three items designed to capture individuals' beliefs about the malleability of intelligence and learning ability. The instrument has demonstrated high internal consistency (α ranging from 0.94 to 0.98) and strong test–retest reliability (r = 0.80 over a two-week period). Responses were recorded on a seven-point Likert scale. The three items were combined into a composite latent construct representing growth mindset and were treated as an exogenous variable in the structural equation models, with both direct and indirect effects on doctoral success examined.

3.2.3 Doctoral Students' Success

Doctoral success was conceptualized as doctoral students' academic progress and measured by comparing students' actual academic progress with the expected PhD output requirements and milestones, following the approach proposed by Matheka et al., (2020). The construct captures multiple dimensions of doctoral progression, including coursework completion, research advancement, and adherence to program timelines. Doctoral success was measured using a 10-item scale rated on a five-point Likert scale. All retained items were combined into a single composite latent construct, which served as the primary endogenous variable in the structural equation models.

3.3 Analytical framework

3.3.1 Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) was conducted as a preliminary step to examine the underlying factor structure of the measurement instruments before specifying the structural equation model. Half of the sample was used for the EFA and the remaining half used for

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CFA. EFA was therefore essential to assess whether the observed indicators adequately represented their intended latent constructs and to identify poorly performing items that could compromise the reliability and validity of the measurement model. Prior to conducting EFA, the suitability of the data for factor analysis was assessed using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity. The KMO values exceeded the recommended threshold of 0.60, while Bartlett's test was statistically significant, confirming that the correlation matrix was appropriate for factor extraction.

Factor extraction was performed using principal axis factoring with an appropriate rotation method to allow for correlations among factors. Items were retained based on standard criteria, including factor loadings of at least 0.40, absence of substantial cross-loadings, and theoretical coherence with the underlying construct. As a result of this process, some Emotional Intelligence items were dropped due to low factor loadings or significant cross-loadings across multiple factors. Retaining such items could have introduced measurement error and weakened the interpretability of the latent construct. EFA results are needed to obtain a refined measurement structure with items that demonstrated strong loadings on their respective factors, thereby improving construct clarity, internal consistency, and overall measurement quality. The refined factor structure the serves as the empirical basis for the subsequent confirmatory factor analysis

Following the EFA, Confirmatory Factor Analysis (CFA) was conducted to validate the factor structure identified in the exploratory phase and to assess the adequacy of the measurement model within the structural equation modelling (SEM) framework. CFA allowed for a rigorous test of the hypothesized relationships between latent constructs and their observed indicators by explicitly specifying the measurement model based on theory and EFA results. The CFA was estimated using maximum likelihood estimation with missing values handled through full information maximum likelihood procedures. Model fit was evaluated using multiple goodness-of-fit indices, including the chi-square statistic, the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). All indicators loaded significantly on their respective latent constructs, with standardized factor loadings exceeding recommended minimum values (signifies strong

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convergent validity). Construct reliability and validity were further assessed using composite reliability and average variance extracted measures, which confirmed that the latent constructs were measured reliably and captured sufficient variance from their indicators. Based on the CFA after EFA, the study ensured that only empirically validated and theoretically meaningful items were included in the final measurement model.

3.3.2 Structural equation modelling (SEM)

The Structural Equation Modelling (SEM) wase applied to analyze the data. Composite indicators for the constructs were computed and used for the analysis. The conceptualization of mediation analysis was proposed by Baron and Kenny's causal stepwise regression method in 1986. The mediation analysis has been widely used in psychology and consumer research. However, the disadvantage of this method is that it observes the significant changes of the direct effect by controlling the intermediary variable rather than by directly measuring the significance of the intermediary effect. There are several models can be applied in structural equation modeling such as path analysis, factor analysis, latent variable structural models, and growth curve models. In this study, a mediation model was established using path analysis through SEM. For mediation analysis, SEM models are best represented by path diagrams. The diagram below is a summary diagram of the hypothesis tested in the study.

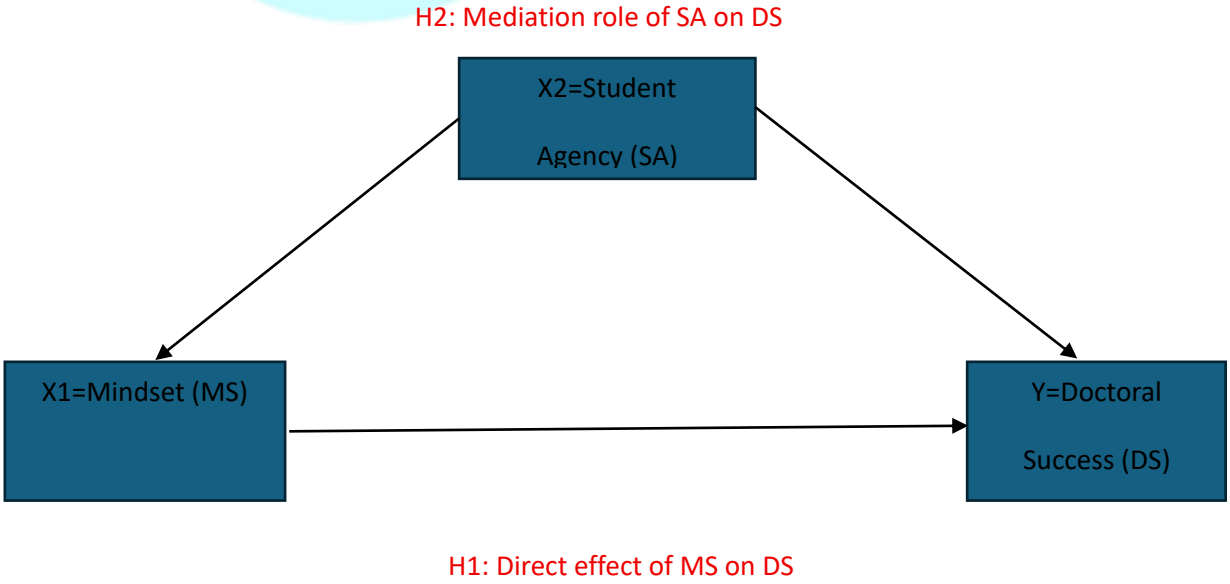


Figure 1: Structural model

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SEM in the context of mediation analysis has advantages when a model contains latent variables. SEM provides for the assessment of linkages in a proposed mediation process as well as the direct effect of the predictor variables on the outcome and the mediation effect, which describes how an exogenous variable affects the outcome variable through the mediator**.** The indirect effect refers to the extent of mediation. The two forms of mediation effects are full and partial. Full mediation can be demonstrated when predictor variable X shows significant influence on mediating variable M that in turn significantly influences dependent variable Y without having any direct effect on the dependent variable. However, if predictor X shows a direct effect on dependent variable Y in addition to a mediation or indirect effect, it is called partial mediation. No mediation effect is found when the predictor variable has no significant relationship with the mediation variable. The parameters estimated from SEM define the type and magnitude of the relationship between variables in a model, as well as data on the model's overall fit with different indices. Fit indices are a useful tool for evaluating how well a model reflects the observed data. The comparative fit index (CFI), normed fit index (NFI), root mean square error of approximation (RMSEA), and standardized root-mean-square residual (SRMR) are the model fit indices which were considered in this study with maximum likelihood estimation.

In Figure 1 above, the hypothesized relationships in the model suggest that the independent variable (X) influences the dependent variable (Y) both directly and indirectly through a mediating variable (student agency). The model also includes a direct path from X to Y, implying the possibility of partial mediation. This structure allows for the assessment of both the individual and combined effects of emotional intelligence (X) and the mediation variable (M) on the overall outcome (doctoral success), while also accounting for the direct impact of the independent factor (X). The statistical diagram represents two equations

$$M = i_1 + aX + e_M \qquad [1]$$

$$Y = i_2 + bM + c'X + e_y \qquad [2]$$

Where i_1 and i_2 are intercepts,

a represents the effect of aX on the mediator M,

b represents the effect of M on the outcome Y

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c′ represents the direct effect of X on Y controlling for M, and

e_M and e_y are disturbance terms assumed to be normally distributed with zero means and finite variances.

The direct effect of X on Y: In Equation (2), c' estimates the direct effect of X on Y.

The indirect effect of X on Y: a×b. The total effect of X on Y: It is equal to the sum of the direct and indirect effects of X: i.e. C (total effect) = c' + a×b. It can be further illustrated by combining Equation (1) with (2) to yield equation (3) below:

$$Y = i = (c' + ab)X + e_y \quad [3]$$

4. Results and discussion

4.1 Model Diagnostics

4.1.1 EFA of student agency

The exploratory factor analysis for student agency as seen in Table 2, demonstrated excellent data adequacy, supported by a KMO value of 0.947 and a highly significant Bartlett's Test of Sphericity ($\chi^2 = 3581.37$, df = 378, $p < 0.001$). The scree plot (Figure 2) indicates a clear inflection after the fourth component, suggesting a multidimensional construct. Consistently, four factors emerged with eigenvalues greater than 1, jointly explaining 85% of the total variance (31.48%, 23.35%, 15.31%, and 14.78%, respectively). This confirms that student agency among doctoral students is not a singular trait but a composite of interrelated dimensions.

Table 2: EFA on student agency

Variable	Factor1	Factor2	Factor3	Factor4	Uniqueness
1. I take a lot of care before choosing	**0.848**	-0.369	-0.069	-0.039	0.139
2. I consider how best to carry out a decision	**0.834**	-0.375	-0.004	-0.084	0.157
3. I try to be clear about my objectives before choosing	**0.847**	-0.347	-0.050	-0.063	0.155
4. When making decisions, I like to collect a lot of information	**0.850**	-0.350	-0.075	-0.057	0.147

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5. I like to consider all the alternatives	**0.847**	-0.332	-0.098	-0.038	0.161
6. I feel confident about my ability to make decisions	**0.851**	-0.335	-0.056	-0.047	0.159
7. I think that I am a good decision maker	**0.850**	-0.355	-0.048	-0.057	0.147
8. The decisions I make turn out well	**0.842**	-0.325	-0.074	-0.076	0.174
9. PhD helps develop other aspects of my life	0.280	**0.871**	0.056	-0.017	0.160
10. PhD is an extension of me	0.304	**0.861**	0.089	-0.012	0.158
11. PhD helps me take responsibility for life changes	0.266	**0.881**	0.080	-0.041	0.145
12. Training hard will improve my performance	0.253	**0.875**	0.093	-0.006	0.162
13. PhD helps me prove I can succeed in studies	0.273	**0.882**	0.069	-0.006	0.142
14. I enjoy learning new things during PhD	0.272	**0.881**	0.055	-0.025	0.145
15. I enjoy discovering new knowledge	0.277	**0.872**	0.104	-0.026	0.152
16. I enjoy learning about topics I like	0.295	**0.865**	0.062	-0.024	0.161
17. I enjoy the challenge of difficult academic tasks	0.259	**0.886**	0.097	-0.017	0.138
18. PhD allows me to keep learning about things I enjoy	0.259	**0.882**	0.067	-0.034	0.150
19. I know how to decrease my nervousness	-0.014	-0.156	**0.827**	-0.397	0.134
20. Most of the time, I feel at peace with myself	-0.035	-0.139	**0.802**	-0.456	0.129
21. I can rapidly relax even in strong tension	0.026	-0.184	**0.812**	-0.414	0.135
22. When something upsets me, I can easily calm down	-0.002	-0.165	**0.799**	-0.437	0.143

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23. I can reduce my tension level when it starts bothering me	-0.017	-0.179	**0.823**	-0.389	0.139
24. Study even when there are distractions	0.075	-0.093	0.407	**0.808**	0.166
25. Always concentrate on my PhD work	0.122	-0.091	0.401	**0.823**	0.139
26. Plan my PhD-related activities for the day	0.124	-0.056	0.414	**0.817**	0.143
27. Organize my PhD-related activities	0.101	-0.057	0.440	**0.817**	0.125
28. Motivate myself to study and work	0.111	-0.110	0.447	**0.747**	0.218
Suitability statistics					
Eigenvalue	8.814	6.53688	4.2879	4.1386	
Variance explained (%)	0.3148	0.2335	0.1531	0.1478	
Kaiser-Meyer-Olkin (KMO) = 0.947					
Bartlett's test of sphericity (BTOS) $\chi 2 =$ 3581.365; df = 378; p = 0.000					

Note: Factor 1= Motivation; Factor 2= Intentionality; Factor 3= Self-Regulation; Factor 4= Self-Efficacy

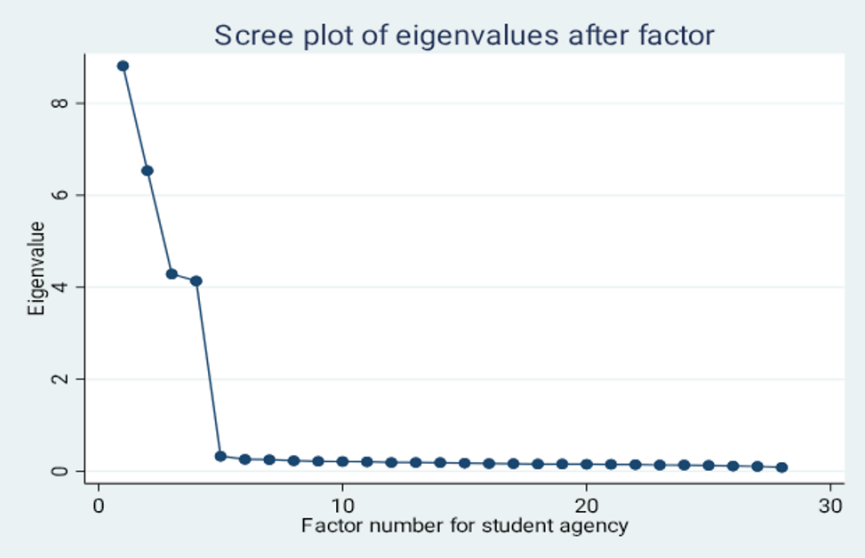


Figure 2: Scree plot for student agency

4.1.2 Exploratory Factor Analysis (EFA) for Mindset

Figure 3 shows the scree plot for mindset and it demonstrates a clear elbow after the first factor, providing strong empirical support for a unidimensional mindset construct. Consistently, the EFA results indicate that all three mindset items load heavily on a single

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latent factor (0.818–0.905). It shows a coherent fixed-mindset orientation among respondents. The factor accounted for a substantial 75.6% of the total variance (eigenvalue = 2.266). The acceptable KMO statistic (0.695) and highly significant Bartlett's Test of Sphericity further confirm that the data were suitable for factor analysis. These results align with theoretical and empirical expectations in the mindset and psychological constructs literature, where KMO values above 0.60 and significant Bartlett's tests are considered indicative of adequate sampling adequacy and factorability (Kaiser, 1974; Field, 2018). Similar applications in studies examining student motivation, self-belief, and other dimensions of student agency demonstrate that such EFA statistics reliably support the validity and interpretability of latent constructs (Dai et al., 2023; de Kleijn et al., 2015).

Table 3: EFA for mindset

Variable	**Factor1**	**Uniqueness**
You have a certain amount of intelligence and can't change it	0.882	0.221
Your intelligence is something you can't change very much	0.905	0.180
You can learn new things, but can't change basic intelligence	0.818	0.332
Suitability statistics		
Eigenvalue	2.266	
Variance explained (%)	0.7556	
Kaiser-Meyer-Olkin (KMO)	0.695	
Bartlett's test of sphericity (BTOS)	$\chi2$ = 496.058; df = 3; p = 0.000	

Note: Factor 1=Mindset

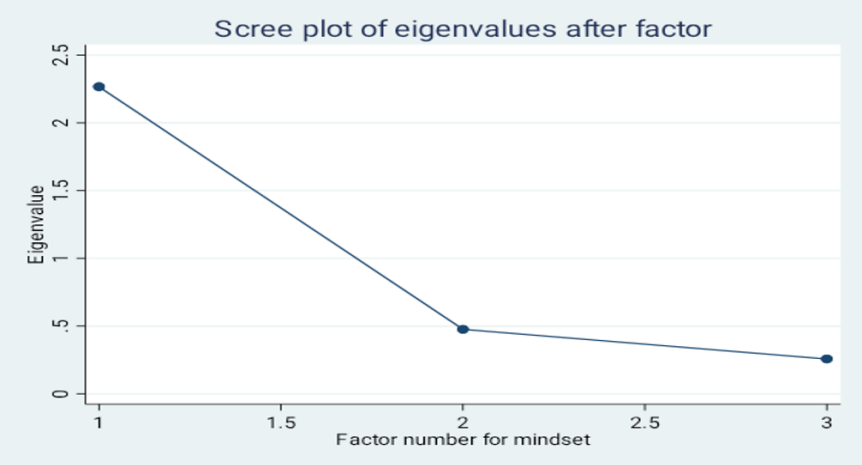


Figure 3: Scree plot for mindset

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4.1.3 Exploratory Factor Analysis (EFA) for Doctoral success

The EFA results for doctoral success (Figure 4) provide strong empirical support for its treatment as a unidimensional latent construct. The scree plot shows a clear and steep decline after the first factor, indicating a dominant underlying dimension, consistent with the Kaiser criterion and visual inspection. From Table 4, it can be seen that factor loadings are uniformly high (0.674–0.777), suggesting that milestones spanning coursework, examinations, research execution, scholarly outputs, and thesis completion coherently capture doctoral success. The first factor explains 54.8% of the total variance, which is substantial for an educational construct of this breadth. The KMO value of 0.900 indicates excellent sampling adequacy, while Bartlett's test confirms sufficient inter-item correlations. Overall, the results demonstrate strong construct validity and internal coherence of the doctoral success measure, consistent with prior doctoral progression frameworks.

Table 4: Exploratory Factor Analysis (EFA) for Doctoral success

Variable	**Factor1**	**Uniqueness**
Passed all course work	0.761	0.421
Passed comprehensive exams	0.777	0.397
Successful proposal defense / experiential research	0.752	0.435
Experimental work / fieldwork / data collection	0.733	0.463
Presented in 4 seminars	0.674	0.546
Published/submitted 2+ papers	0.724	0.475
Thesis submitted for examination	0.765	0.414
Successful thesis defense or Viva	0.720	0.482
Final thesis submission	0.753	0.433
Graduation or final completion	0.739	0.455
Suitability statistics		
Eigenvalue	5.4790	
Variance explained (%)	0.5479	
Kaiser-Meyer-Olkin (KMO)	0.900	
Bartlett's test of sphericity (BTOS)	$\chi 2 = 1997.085$; df = 45; p = 0.000	

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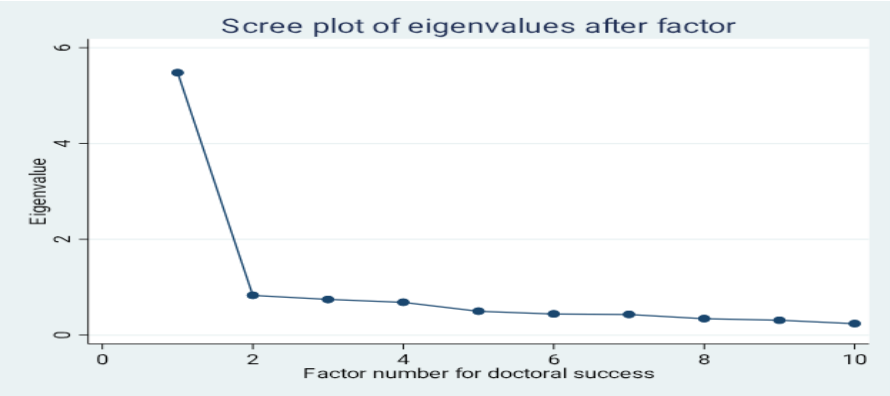


Figure 4: Scree plot for doctoral success

4.1.4 Construct validity and reliability

The reliability and validity statistics presented in Table 5 further support the adequacy of the refined measurement model. All four dimensions of student agency exhibit exceptionally strong psychometric properties (i.e., minimal measurement error). Mindset and doctoral success also satisfy established reliability and validity criteria, reinforcing their suitability for inclusion in subsequent mediation and structural analyses.

Table 5: Reliability and Validity results

Student Agency – Intentionality (CR = 0.975 ; AVE = 0.823 ; CA = 0.974)	**Standardized Loadings**
I take a lot of care before choosing	0.918
I consider how best to carry out a decision	0.902
I try to be clear about my objectives before choosing	0.907
When making decisions, I like to collect a lot of information	0.913
I like to consider all the alternatives	0.901
I feel confident about my ability to make decisions	0.904
I think that I am a good decision maker	0.913
The decisions I make turn out well	0.893
Student Agency – Motivation (CR = 0.986 ; AVE = 0.831 ; CA = 0.980)	
PhD helps develop other aspects of my life	0.906
PhD is an extension of me	0.907
PhD helps me take responsibility for life changes	0.916
Training hard will improve my performance	0.904

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PhD helps me prove I can succeed in studies	0.918
I enjoy learning new things during PhD	0.915
I enjoy discovering new knowledge	0.911
I enjoy learning about topics I like	0.905
I enjoy the challenge of difficult academic tasks	0.921
PhD allows me to keep learning about things I enjoy	0.912
Student Agency – Self-Regulation (CR = 0.974 ; AVE = 0.829 ; CA = 0.960)	
I know how to decrease my nervousness	0.913
Most of the time, I feel at peace with myself	0.916
I can rapidly relax even in strong tension	0.910
When something upsets me, I can easily calm down	0.904
I can reduce my tension level when it starts bothering me	0.908
Student Agency – Self-Efficacy (CR = 0.966 ; AVE = 0.845 ; CA = 0.952)	
Study even when there are distractions	0.887
Always concentrate on my PhD work	0.914
Plan my PhD-related activities for the day	0.917
Organize my PhD-related activities	0.914
Motivate myself to study and work	0.841
Mindset (CR = 0.843; AVE =0.645; CA = 0.837)	
You have a certain amount of intelligence and can't change it	0.818
Your intelligence is something you can't change very much	0.901
You can learn new things, but can't change basic intelligence	0.673
Doctoral Success (CR = 0.879 ; AVE = 0.500 ; CA = 0.908)	
Passed all course work	0.730
Passed comprehensive exams	0.752
Successful proposal defense / experiential research	0.722
Experimental work / fieldwork / data collection	0.698
Presented in 4 seminars	0.627
Published/submitted 2+ papers	0.684

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Thesis submitted for examination	0.734
Successful thesis defense or Viva	0.683
Final thesis submission	0.715
Graduation or final completion	0.703

NB: CR = composite reliability; AVE = average variance extracted; CA = Cronbach alpha

The reliability and validity statistics further support the adequacy of the refined measurement model. All four dimensions of student agency exhibit exceptionally strong psychometric properties, reflecting clear construct definition and minimal measurement error. Mindset and doctoral success also satisfy established reliability and validity criteria, reinforcing their suitability for inclusion in subsequent mediation and structural analyses. Overall, the results confirm that the revised measurement model is robust and provides a sound foundation for testing the hypothesized relationships in the study

4.2 Hypothesis of the research objectives

Table 6 presents the results of the hypotheses formulated to address the research objectives. Specifically, the table reports the effects of mindset on doctoral students' academic progression, and the mediating role of student agency in the relationship between mindset and doctoral success. The results are presented in Sections 4.2.1 to 4.2.2, respectively.

4.2.1 Effect of mindset on academic progression of doctoral students

Based on the first hypotheses in Table 6, the results reveal that mindset demonstrates a highly significant and substantial effect on doctoral success, with an unstandardized coefficient of 0.307 ($p < 0.01$). This indicates that a one-unit increase in growth-oriented mindset beliefs corresponds to a 0.307 increase in doctoral success scores, holding other factors constant. The magnitude of this effect is notably larger than those observed for emotional intelligence and student agency, highlighting mindset as a particularly strong predictor of academic progression. Students with a growth mindset are likely to approach challenges as opportunities for learning, persist in the face of setbacks, and maintain adaptive strategies for mastering complex doctoral tasks. These mechanisms suggest that beliefs about intelligence and the capacity for development directly influence motivation, effort allocation, and engagement with research milestones, which translate into measurable progress in doctoral studies.

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The effect aligns with prior literature demonstrating the centrality of growth-oriented beliefs in academic performance, particularly in higher education settings where self-directed learning and resilience are critical (Dweck, 2006; Claro et al., 2016). The results are theoretically supported by Mindset Theory, which posits that individuals who view abilities as malleable are more likely to persist through challenges and capitalize on feedback to enhance performance.

Model fit indices indicate excellent specification, with RMSEA 0.00, CFI 1.00, TLI 1.00, and SRMR 0.00, confirming the appropriateness of the model. The R^2 value of 0.286 shows that mindset and the included covariates collectively explain 28.6% of the variance in doctoral success, reflecting a meaningful proportion of variance for a construct that is largely psychological and attitudinal. The χ^2 statistic, 131.184, is acceptable given the model complexity and sample size. These findings demonstrate that mindset is a particularly strong determinant of doctoral progression, illustrating how cognitive beliefs about the malleability of intelligence can drive engagement, resilience, and measurable academic outcomes.

Table 6: Hypothesis testing results

Control variables	**Doctoral success**				
	B	**SE**	**β**	**SE**	**95% CI [B]**
Age	0.009	0.009	0.056	0.056	−0.009, 0.027
Marital Status (1=Married; 0=otherwise)	-0.161	0.100	-0.112	0.069	−0.358, 0.035
Having children (1=Yes; 0=No)	0.423**	0.179	0.185**	0.077	0.073, 0.773
Employment status (1=Employed; 0=otherwise	0.145	0.150	0.062	0.064	−0.148, 0.438
PhD funding status (1=self-funded)	-0.461***	0.164	-0.139***	0.049	−0.783, −0.138
Constant	2.258***	0.608	1.972***	0.545	1.066, 3.450
Hypotheses					
H1: Mindset --> doctoral success	0.307***	0.027	0.496***	0.036	0.255, 0.360
H2: Mindset --> student agency --> doctoral success					
Direct effect	0.305***	0.027	0.290***	0.026	0.253, 0.358
Indirect effect	0.012***	0.003	0.011***	0.003	0.004, 0.018

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Total effects	0.317***	0.027	0.301***	0.026	0.257, 0.377
Goodness of fit indicators					
RMSEA	*0.001*				
χ2	*27.762*				
CFI	*0.990*				
TLI	*0.980*				
SRMR	*0.006*				
R^2	*0.160*				
Observations	390				

Source: Field data, 2025.

**** p<0.01, ** p<0.05, * p<0.1*

4.2.2 Student agency as a mediator between mindset and doctoral success

Hypothesis two (H2) as presented in Table 6 shows that mindset exerts a strong and highly significant direct effect on doctoral success at the 1% level. Such results mean that students with growth-oriented beliefs achieve higher academic progression independently of their level of agency. This finding is consistent with Mindset Theory, which posits beliefs about the malleability of intelligence shape persistence, adaptability, and responses to academic challenges (Dweck, 2006). The indirect effect through student agency is positive, small, and statistically significant at the one percent level, suggesting that mindset also contributes to doctoral success by modestly strengthening intentionality, motivation, and self-regulatory behaviors. Because the direct effect remains substantial alongside a nonzero indirect effect, this pattern represents partial mediation, with student agency transmitting a limited portion of the total effect of mindset on doctoral progression.

These findings indicate that the dominant pathway is cognitive in nature, as growth-oriented beliefs influence how doctoral students interpret setbacks, approach demanding research tasks, and persist through prolonged periods of uncertainty. This is consistent with Dweck's (2006) argument that growth-oriented beliefs foster resilience and sustained effort in the face of difficulty.

Student agency provides a supportive but secondary route by reinforcing goal directed behaviors such as planning, monitoring, and sustained engagement. In line with Self-

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Regulated Learning Theory, agency functions as an enabling mechanism through which learners translate their beliefs into strategic action, although it does not replace the central role of underlying cognitive orientations in shaping academic performance (Zimmerman, 2002).

In practical terms, students who endorse growth-oriented beliefs are more likely to engage in purposeful and motivated behaviors that support doctoral progression, but their core beliefs remain the primary driver of success. The mediating role of agency therefore reflects an auxiliary pathway that strengthens, rather than determines, the influence of mindset on academic outcomes.

The mediation model demonstrates strong fit, with RMSEA = 0.031, CFI = 0.985, TLI = 0.962, and SRMR = 0.025, confirming that the specified pathways adequately represent the observed data. The R^2 value of 0.288 indicates that mindset, student agency, and the control variables together explain 28.8 percent of the variance in doctoral success. The chi square statistic of 143.964 is acceptable given the complexity of the model and the sample size. These results indicate that mindset is the dominant determinant of doctoral success, while student agency provides a small but statistically meaningful mediating pathway that modestly strengthens the translation of growth-oriented beliefs into sustained academic progression.

5. Conclusions and recommendations

This study evaluated the effects of mindset on academic progression of doctoral students in Ghana and further tested the mediation role of student agency in such relationship. The results from the SEM model revealed that mindset demonstrated a large and highly significant positive effect on doctoral success at the 1% level. This finding underscores the central role of growth-oriented beliefs in shaping doctoral outcomes. Doctoral students who believe that abilities can be developed through effort and learning are more likely to persist, adapt to feedback, and remain resilient in the face of academic challenges. Regarding whether student agency mediates the relationship between mindset and doctoral success, the results confirm a statistically significant positive indirect effect at the 1% level, alongside a strong direct effect of mindset. This constitutes partial mediation, which means that mindset influences doctoral success both directly and indirectly. This effect

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could occur by strengthening students' intentionality, motivation, and self-regulatory capacities. Although the indirect effect is modest in magnitude, it confirms that agency serves as a meaningful behavioral channel through which growth-oriented beliefs are translated into academic progress. In conclusion, the study demonstrates that doctoral progression is enhanced by growth mindset and the relationship is significantly mediated by student agency. Since student agency significantly mediate the relationship, graduate schools should require doctoral candidates to prepare and periodically update individualized doctoral action plans with clear milestones and reflective progress reports reviewed by supervisory committees. As mindset showed the strongest direct influence on doctoral success, PhD students are to intentionally cultivate a growth mindset and through that, reframe academic setbacks as opportunities for growth rather than reflections of their intellectual capability. Based on the conclusion, future research should extend this study to a longitudinal study, following doctoral students over time. Tracking the same individuals from early candidature through completion would enable researchers to assess how mindset and student agency change dynamically and how their effects on academic progression strengthen, weaken, or reverse at different stages of the doctoral journey.

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Appendices

Appendix I: Student Agency: Intentionality Items

Variables	Mean	SD	Min	Max	Skew.	Kurt.
1. I take a lot of care before choosing	3.02	1.33	1.00	5.00	0.01	1.91
2. I consider how best to carry out a decision	2.95	1.32	1.00	5.00	0.01	1.91
3. I try to be clear about my objectives before choosing	2.95	1.33	1.00	5.00	0.09	1.92
4. When making decisions, I like to collect a lot of information	2.90	1.29	1.00	5.00	0.11	2.07
5. I like to consider all the alternatives	2.94	1.33	1.00	5.00	0.08	1.92
6. I feel confident about my ability to make decisions	2.99	1.36	1.00	5.00	0.01	1.88
7. I think that I am a good decision maker	2.93	1.31	1.00	5.00	0.05	1.97
8. The decisions I make turn out well	3.00	1.31	1.00	5.00	-0.04	1.94
Composite score (Student Agency: Gen. Motivation)	2.96	1.22	1.00	5.00	0.04	1.99

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Appendix II: Student Agency: Motivation Items

Variables	Mean	Std. Dev.	Min	Max	Skew.	Kurt.
1. PhD helps develop other aspects of my life	2.985	1.297	1	5	-.092	1.959
2. PhD is an extension of me	2.969	1.36	1	5	-.079	1.815
3. PhD helps me take responsibility for life changes	2.972	1.331	1	5	-.014	1.885
4. Training hard will improve my performance	2.956	1.366	1	5	-.006	1.826
5. PhD helps me prove I can succeed in studies	2.979	1.339	1	5	-.027	1.882
6. I enjoy learning new things during PhD	2.987	1.323	1	5	-.043	1.923
7. I enjoy discovering new knowledge	2.915	1.368	1	5	.056	1.852
8. I enjoy learning about topics I like	2.923	1.366	1	5	0	1.809
9. I enjoy the challenge of difficult academic tasks	2.954	1.312	1	5	.017	1.916
10. PhD allows me to keep learning about things I enjoy	2.96	1.233	1	5	-.056	1.873
Composite score (Student Agency: Motivation)	2.96	1.22	1.0	5.00	0.04	1.99

Appendix III: Student Agency: Self-Regulation Items

Variables	Mean	Std. Dev.	Min	Max	Skew.	Kurt.
1. I know how to decrease my nervousness	2.99	1.35	1.00	5.00	0.00	1.87
2. Most of the time, I feel at peace with myself	3.02	1.39	1.00	5.00	-0.04	1.81
3. I can rapidly relax even in strong tension	3.02	1.39	1.00	5.00	-0.03	1.78
4. When something upsets me, I can easily calm down	3.03	1.37	1.00	5.00	-0.02	1.84
5. I can reduce my tension level when it starts bothering me	3.01	1.38	1.00	5.00	-0.02	1.83
Composite score (Student Agency: Self-Regulation)	3.02	1.28	1.00	5.00	-0.04	1.80

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Appendix IV: Student Agency: Self-Efficacy Items

Variables	Mean	SD	Min	Max	Skew.	Kurt.
1. Study even when there are distractions	4.31	1.06	1.00	5.00	-1.58	4.75
2. Always concentrate on my PhD work	4.15	1.16	1.00	5.00	-1.35	3.90
3. Plan my PhD-related activities for the day	4.09	1.20	1.00	5.00	-1.23	3.45
4. Organize my PhD-related activities	4.24	1.11	1.00	5.00	-1.49	4.31
5. Motivate myself to study and work	4.32	1.07	1.00	5.00	-1.55	4.43
Composite (Self-Efficacy Items)	4.22	1.03	1.00	5.00	-1.35	3.89
Overall Composite Student Agency	3.29	0.58	1.09	4.73	-0.17	3.16

Appendix V: Mindset Beliefs Items

Variables	Mean	Std. Dev	Min	Max	Skew.	Kurt.
1. You have a certain amount of intelligence and can't change it	3.93	2.08	1.00	7.00	0.16	1.71
2. Your intelligence is something you can't change very much	3.83	2.18	1.00	7.00	0.15	1.59
3. You can learn new things, but can't change basic intelligence	3.57	2.12	1.00	7.00	0.44	1.76
Composite (Mindset Beliefs)	3.78	1.85	1.00	7.00	0.46	2.05

Appendix VI: Doctoral Success Items

Variables	Mean	SD.	Min	Max	Skew.	Kurt.
1. Passed all course work	3.35	1.58	1.00	5.00	-0.24	1.43
2. Passed comprehensive exams	3.39	1.61	1.00	5.00	-0.40	1.57
3. Successful proposal defense / experiential research	3.42	1.53	1.00	5.00	-0.36	1.63
4. Experimental work / fieldwork / data collection	3.35	1.57	1.00	5.00	-0.28	1.50
5. Presented in 4 seminars	3.72	1.49	1.00	5.00	-0.70	1.95
6. Published/submitted 2+ papers	3.41	1.50	1.00	5.00	-0.31	1.61

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7. Thesis submitted for examination		3.31	1.48	1.00	5.00	-0.18	1.56
8. Successful thesis defense or Viva		3.57	1.54	1.00	5.00	-0.44	1.54
9. Final thesis submission		3.35	1.57	1.00	5.00	-0.21	1.41
10. Graduation or final completion		3.50	1.63	1.00	5.00	-0.47	1.54
	Composite score (Doctoral Success)	3.44	1.15	1.0	5.00	-0.37	2.04

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