



When Does Enterprise Education Matter Most? The Interplay of Entrepreneurial Orientation, Family Environment, and Resource Availability in Shaping Startup Mindset

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Abstract

Despite the attempts of many studies, research on the effect of enterprise education, especially the relationship between enterprise education and startup mindset, still shows conflicting results and does not clarify the relationship. This study empirically verifies the impact of enterprise education in universities on the willingness to start a business among university students who are potential entrepreneurs and to reveal new factors that moderate the relationship between enterprise education and startup mindset. To validate the research model of this study, the questionnaires of 265 undergraduate science and engineering students from Bolgatanga Technical University and C. K. Tedam University of Technology & Applied Sciences were analyzed using independent sample t-test and hierarchical regression analysis. The results of the analysis showed that students who took enterprise education had higher startup mindset. The significant moderating effects of innovativeness, risk-taking, and proactiveness among entrepreneurial orientation and entrepreneurial family environment among environmental factors were confirmed, indicating that the higher the innovativeness and proactiveness, the greater the influence of enterprise education on startup mindset, while the higher the risk-taking, and the presence of entrepreneurial family environment, the less the influence of enterprise education on startup mindset.

Keywords: enterprise education, startup mindset, entrepreneurial orientation, entrepreneurial family environment, access to resources

Introduction

Entrepreneurship is widely acknowledged as a key engine of economic development, innovation, and social progress (Li et al., 2021). As a result, developing startup mindset, that is, an individual's desire to establish a business, has been a primary focus of academic study and policy initiatives. Enterprise education is critical in providing individuals with the information, skills, and mentality required to undertake entrepreneurial endeavors (Suguna et al., 2024). However, the success of such education in generating startup mindset is impacted by a variety of circumstances that exist outside of the classroom.

This study looks at the relationship between enterprise education in universities and startup mindset of university students who are potential entrepreneurs, with particular emphasis on the moderating effects of entrepreneurial orientation, environmental factors and access to resources. Entrepreneurial orientation, which includes characteristics like risk-taking, innovativeness, and proactiveness, demonstrates a person's proclivity for entrepreneurial activity (Lone & Baba, 2024). Environmental factors, such as cultural, family, economic, and institutional settings, can either support or hinder entrepreneurial activities (Sobhan & Hassan, 2024). Access to resources, such as financial, social, and informational capital, can help individuals bridge the gap between education and intention, allowing them to turn their knowledge into effective results (Rasulong et al., 2025). Understanding how these moderating variables interact with enterprise education gives further information about the mechanisms that influence startup mindset.

Therefore, the core questions of this study are summarized as follows. First, does the presence or absence of enterprise education make a difference in startup mindset? Second, is there a positive relationship between enterprise education and startup mindset? Finally, how do individual psychological characteristics, entrepreneurial orientation, and



environmental factors, entrepreneurial family environment and access to resources, affect the relationship between enterprise education and startup mindset?

Based on these key questions, this study demonstrates that there is a positive relationship between enterprise education and startup mindset, and examines the effects of entrepreneurial orientation and environmental factors as new moderating variables on the inconsistent results of the relationship between enterprise education and startup mindset. By investigating these dynamics, the study hopes to add to the increasing body of knowledge on enterprise education and provide practical consequences for educators, policymakers, and aspiring entrepreneurs. The findings are likely to offer insight on how personalized educational programs and supportive surroundings might promote a greater entrepreneurial spirit in a variety of settings.

Theoretical Background

Enterprise education

Enterprise education can be said to foster the entrepreneurial will of potential entrepreneurs by educating them on entrepreneurship-related knowledge and attitudes necessary for exploring business ideas, developing specific business plans, and successfully operating a business (Saoula et al., 2025). Enterprise education includes potential entrepreneurs and how they learn the knowledge, skills, and attitudes necessary for entrepreneurship (Mujtaba et al., 2025).

In particular, the need and importance of enterprise education has been emphasized from the perspective that entrepreneurs can be nurtured and acquired through enterprise education (Akpomi & Kayii, 2022; Badawi, 2024; Murray et al., 2018). Various studies have been conducted on the effectiveness and necessity of enterprise education, starting with Timmons and Spinelli (2009), who argued that enterprise education is necessary because it can enhance the willingness to start a business through education. Enterprise education is necessary because it reduces failures in the real market by learning from various failures (McGrath, 1999; Ratten & Jones, 2021), and negative perceptions of entrepreneurship due to uncertainty can be improved by replacing uncertainty with knowledge through enterprise education (Crosina et al., 2024). Furthermore, enterprise education should be promoted in universities because proper enterprise education is the basis for strengthening national and industrial competitiveness by increasing the number of successful entrepreneurial enterprises (Wang, 2024), enterprise education has a positive effect on motivation to start a business (Chahal et al., 2024), and enterprise education is necessary for the creation of new jobs and continuous innovation in entrepreneurial activities (Fang & Lu, 2025).

Some studies have argued that enterprise education is necessary because it provides people with the opportunity to improve their confidence in starting a business (Otache et al., 2024). However, despite the need for and positive perceptions of enterprise education, there is a lack of consistent evidence that enterprise education helps to produce more or better entrepreneurs. Studies that predict positive outcomes of enterprise education argue that students who participate in enterprise education are more likely to start their own businesses, that there is a positive relationship between enterprise education participation and venture creation, and that enterprise education is necessary because of these positive effects that has the potential to help students escape unemployment and trigger the desire to start a business (Gazi et al., 2024; Shen et al., 2025; Tran et al., 2024). However, there are also studies that claimed contradictory results, suggesting that the relationship between enterprise education and entrepreneurship-related human capital and entrepreneurship is similar, but the relationship between enterprise education and entrepreneurship is stronger for general school-based enterprise education than for training-based enterprise education (Martin et al., 2013), enterprise education is negatively related to many entrepreneurship-related human capital (Mentoor & Friedrich, 2007; Qian, 2024), and there are also studies that show a small but negative relationship or no relationship between enterprise education and skills and attitudes toward entrepreneurship or willingness to start a business (Overwien et al., 2024; Von Graevenitz et al., 2010). Thus, the current literature is mixed on the positive and negative outcomes of enterprise education, and the qualitative studies are also ambiguous and do not adequately explain the results.

Startup mindset

Entrepreneurship is the desire to own your own business or start a new business. It is a state of mind that deals with people's interest in and behavior toward being self-employed as opposed to organizational employment (Bird, 1988) and can be defined as the desire to own or start one's own business by including an individual's general plans to become an entrepreneur as a judgment about the likelihood of owning a business (Van Toai et al., 2024).



As entrepreneurship has been recognized as a key component of startup mindset among other aspects of entrepreneurship, startup mindset have emerged as a major theme in the theoretical literature (Loi et al., 2024) and empirical studies (Abdullah & Othman, 2021) on entrepreneurship and entrepreneurship intentions.

The study of startup mindset was systematically initiated by Bird (1988), Shapero (1975), Shapero and Sokol (2002) and others established research models on startup mindset, Krueger Jr (1993) and Davidsson (1995) summarized and expanded the self-reliant intention model and the startup mindset model to be used in other startup mindset studies, and Rahi et al. (2021) adapted the existing research models to the university context. As can be seen from these studies, the study of startup mindset has been centered on the volitional model. Ajzen's Theory of Planned Behavior (TPB) and Shapero's model of the Entrepreneurial Event (SEE) are the main sources of evidence for explaining the relationship between entrepreneurship and startup mindset (Uctu & Al-Silefanee, 2023). TPB, which is a model for predicting and explaining human behavior in specific situations, states that the more favorable the attitude and subjective reference to the behavior, and the greater the perceived behavioral control, the stronger the willingness to perform the intended behavior (Ajzen, 1991), that human behavior is a planned, cognitive process, and that the intention that drives this behavior is the variable that most accurately predicts and explains whether or not the planned behavior will be carried out, and that the willingness to act, as influenced by attitudes toward the behavior, subjective norms, and perceived behavioral control, is the variable that best explains a person's behavior because it focuses the decision maker's attention on the behavior (Ajzen, 1991). SEE, on the other hand, is based on the assumption that inertia drives human behavior until an event occurs to replace it, and it is believed that startup mindset is explained by Perceived Desirability, the degree of personal attraction to entrepreneurship, Perceived Feasibility, the degree of personal likelihood of entrepreneurship, and Propensity to act, the tendency of people to act on their decisions (Shapero & Sokol, 2002). The idea is that major events, such as job loss or immigration, force people to make choices, and during this process, individuals perceive entrepreneurship as another alternative, and this perception affects their willingness to start a business, which in turn can significantly increase entrepreneurship (Ngo et al., 2024). These two models are significant in that they provide opposing interpretations of startup mindset (Govinda, 2024; Krueger Jr, 1993), and because they provide a systematic basis for understanding human intentions, many studies on startup mindset have utilized the volitional model.

The most researched areas related to entrepreneurship are mainly related to personal characteristics and dispositions, such as risk-taking propensity, locus of control, achievement, tolerance for ambiguity, innovativeness, autonomy, and need for personal control (Steenkamp et al., 2024), and it has been argued that personal attributes are the strongest determinants of startup mindset (Neupane et al., 2025). However, research on personal characteristics as an influencer of startup mindset is criticized for lacking a theoretical basis for why and how personal characteristics affect entrepreneurship, and for having a strong tendency to rationalize after the fact by identifying the effects of personal characteristics after entrepreneurship, so it is necessary to identify causal relationships through research on personal characteristics before entrepreneurship occurs (Oktaviana et al., 2024). It is also argued that locus of control, achievement, and risk-taking, which have been studied in many cases, are general personal characteristics that were not developed to understand the entrepreneurial process and lack usefulness in identifying entrepreneurial motivation and willingness (Weldehawariat et al., 2024). The most fundamental problem is that they predict a strong causal relationship between individual traits and entrepreneurial behavior, overlooking the role of personal expectations, contextual factors, and other factors. An individual's willingness to engage in a particular behavior is influenced not only by personal characteristics and attributes, but also by specific circumstances or environmental factors, and it has been suggested that personal characteristics as well as the individual's socio-cultural background act as catalysts and motivators for entrepreneurial behavior (Masuri et al., 2025).

Relationship between enterprise education and startup mindset

Existing studies on startup mindset have focused on the effects of endogenous factors such as entrepreneurial dispositions and behaviors, demographic characteristics, and self-efficacy on startup mindset, while studies on the relationship with exogenous factors such as social environment and perceptions of entrepreneurship have also been conducted. The implicit premise behind many of these studies is that enterprise education can contribute to the development of students' entrepreneurial attitudes and skills and strengthen their startup mindset. However, the research on the relationship between enterprise education and startup mindset is still lacking in terms of how enterprise education as it is currently practiced and received by students affects startup mindset and the factors that moderate the relationship. The results of the research on the relationship between enterprise education and startup mindset are inconsistent and open to multiple interpretations, with mixed conclusions (Hoang & Trong Luu, 2025). Furthermore,



while many scholars have praised the effectiveness of enterprise education, the impact of enterprise education on startup mindset remains relatively unproven (Romanova, 2022; Vecchiarini & Somia, 2023).

Porfirio et al. (2022) found that enterprise education has a significant positive effect on startup mindset and suggested the need to activate enterprise education to foster startup mindset. Overwien et al. (2024) found that enterprise education can promote startup mindset among college students after graduation, as students who took enterprise education had higher startup mindset than those who did not. Gameti et al. (2024) found that students who participated in enterprise education were more likely to start their own business and a positive relationship was established between participation in enterprise education and venture creation. Benner (2024) found that those who received college-level enterprise education had higher startup mindsets than those who did not. However, there is no clear evidence that the relationship between enterprise education and startup mindset has a positive effect, and it was even found to be negative (Karlan & Valdivia, 2011). Tran et al. (2024) presented a conflicting conclusion that enterprise education does not affect startup mindset, and Oosterbeek et al. (2010) measured the change in startup mindset of graduate students before and after receiving enterprise education and found that enterprise education does not have a significant effect on students' entrepreneurial skills and even has a negative effect on startup mindset after receiving enterprise education. In response to these conflicting results, scholars have conducted comprehensive quantitative and qualitative studies, including meta-analyses, on the relationship between enterprise education and startup mindset, but these studies still fail to resolve the existing.

Setting up a research model and hypothesis

Relationship between enterprise education and startup mindset

As we have seen, the relationship between enterprise education and startup mindset has been mixed.

Despite the verification of various moderating factors of this relationship, there is no verification of the moderating effect of entrepreneurial orientation and environmental factors. This study presents a research model as shown in Figure 1 and establishes hypotheses in order to empirically reveal the effect of enterprise education on startup mindset, which shows conflicting conclusions, and to verify the moderating effect of entrepreneurial orientation and environmental factors.

Enterprise education can help potential entrepreneurs gain the knowledge to become entrepreneurs, making those with entrepreneurial traits more likely to start a business than those without. As mentioned in the theoretical background, several studies have shown a positive relationship between enterprise education and startup mindset. Enterprise education can provide social experiences, such as the opportunity to have significant responsibility, start a business, and observe role models, and these experiences influence people's willingness to pursue careers that are compatible with their learning experiences (Boldureanu et al., 2020). Porfirio et al. (2023) argued that adolescents' participation in enterprise education positively increased their perception of entrepreneurial desire and perception of entrepreneurial aptitude, which positively influenced their startup mindset, while Mei et al. (2020) confirmed that participation in enterprise education positively influenced students' startup mindset and argued for a positive relationship between enterprise education and startup mindset.

In these studies, the presence or absence of enterprise education makes a difference in startup mindset. It can be expected that enterprise education has a positive effect on entrepreneurship intention, so the following hypothesis is proposed.

Hypothesis 1: Enterprise education will have a positive effect on startup mindset.

Moderating effect of entrepreneurial orientation

Moderating variables can change the relationship between enterprise education and startup mindset. Therefore, the study of moderating factors is necessary to better understand why the relationship between enterprise education and startup mindset is inconsistent. In this study, we propose entrepreneurial orientations of innovativeness, risk-taking, proactiveness, and locus of control as moderating factors and environmental factors of entrepreneurial family environment and access to resources as moderating factors. Entrepreneurial orientation is the main characteristic of entrepreneurship. Miller (1983) first used the term 'entrepreneurial orientation' by categorizing entrepreneurship into



innovativeness, initiative, and risk-taking. Gartner (1990) focused on the personality traits and abilities of entrepreneurs and categorized high achievement, risk-taking, locus of control, and tolerance for ambiguity as typical characteristics of entrepreneurs. These attributes are also highly influential on people's willingness to start a business (Li et al., 2022), and it can be said that people with high achievement, risk-taking and ambiguity tolerance, and internal locus of control are more entrepreneurial and active in starting a business (Widjaya et al., 2021). Innovativeness is a disposition that fosters the creative process and supports new ideas (Avcı & Durak, 2023).

Pham et al. (2023) confirmed that innovativeness has a significant positive effect on startup mindset, confirming the findings of previous studies (Juliana et al., 2021) that innovativeness is one of the main factors in entrepreneurship. Maziriri et al. (2024) confirmed the moderating effect of innovativeness by arguing that innovativeness and planning are moderating factors between achievement motivation and entrepreneurial success. Risk-taking is the tendency to take or avoid risks in uncertain situations, and those who are less risk-averse are more likely to start a business (Bate, 2022). Arijanto (2023) found that startup mindset is higher among students with higher risk tolerance.

Proactiveness is the ability to think ahead and be proactive in order to adapt well to new environments, generating forward-looking ideas and anticipating possible problems before they occur (Lumpkin & Dess, 1996). Proactiveness has particular implications for career choice and entrepreneurship (Jiang et al., 2023), and because of its emphasis on proactive behavior, it has been suggested that people who are high in proactiveness are more likely to be entrepreneurial (Crant, 1996). Finally, locus of control refers to the belief in controlling the outcome of one's behavior, and it can be said that individuals with an internal locus of control are more likely to have stronger startup mindset than those with an external locus of control because they believe that they can control the outcome of their behavior through their own abilities, efforts, etc.

Based on these studies, it was expected that the relationship between enterprise education and startup mindset would change depending on students' entrepreneurial orientation. To test this hypothesis, the following hypotheses were proposed: Entrepreneurial orientation exerts a moderating effect.

- Hypothesis
- 2-1: The effect of enterprise education on startup mindset will be positively moderated by innovativeness.
 - 2-2: The effect of enterprise education on startup mindset will be positively moderated by risk-taking.
 - 2-3: The effect of enterprise education on startup mindset will be positively moderated by proactiveness.
 - 2-4: The effect of enterprise education on startup mindset will be positively moderated by locus of control.

Moderating effect of entrepreneurial family background

Entrepreneurial family background and resource accessibility were categorized into two groups: Entrepreneurial family background, which refers to a family in which a parent or family member is involved in business. Several studies have found a positive relationship between parental entrepreneurship and children's likelihood of entrepreneurship (Lyons et al., 2024), and family influence is important in the development of children's career intentions (Lyons et al., 2024; Qi et al., 2024). In addition, entrepreneurial families also positively influence their children's startup mindset through role models (Elias, 2025). Family business experience is one of the important predictors of students' startup mindset, and the existence of an entrepreneurial family environment has been confirmed to have a positive relationship with startup mindset (Liu & Yao-Ping Peng, 2025). Therefore, the following hypothesis is proposed regarding the moderating effect of entrepreneurial family environment on the relationship between entrepreneurial education and startup mindset.

- Hypothesis 3: The effect of enterprise education on startup mindset will be positively moderated by the entrepreneurial family environment.

Moderating effect to access to resources

Finally, access to resources refers to the degree of access to key resources needed to start a business and is an important factor in entrepreneurship. This has been mainly discussed in terms of social support, i.e. the existence of a personal support network, and it has been proven in several studies that the existence of a support network, where entrepreneurs can receive emotional, technical and financial support, has a positive impact on startup mindset (Saoula et al., 2025). In addition, social support forces act as a factor that increases startup mindset by providing tangible and intangible resources required by entrepreneurs, such as human and financial resources, social support, and problem solving, as well as information about markets, opportunities, etc.; (Nguyen et al., 2025), and access to resources such as professional advice and counseling on starting a business, obtaining necessary information, and securing financing. We hypothesize that the degree of access to resources that enable entrepreneurs to identify new opportunities and various information, and that support the procurement of resources such as advice and management is a factor that increases startup mindset.

Hypothesis 4: The effect of enterprise education on startup mindset will be positively moderated by access to resources.

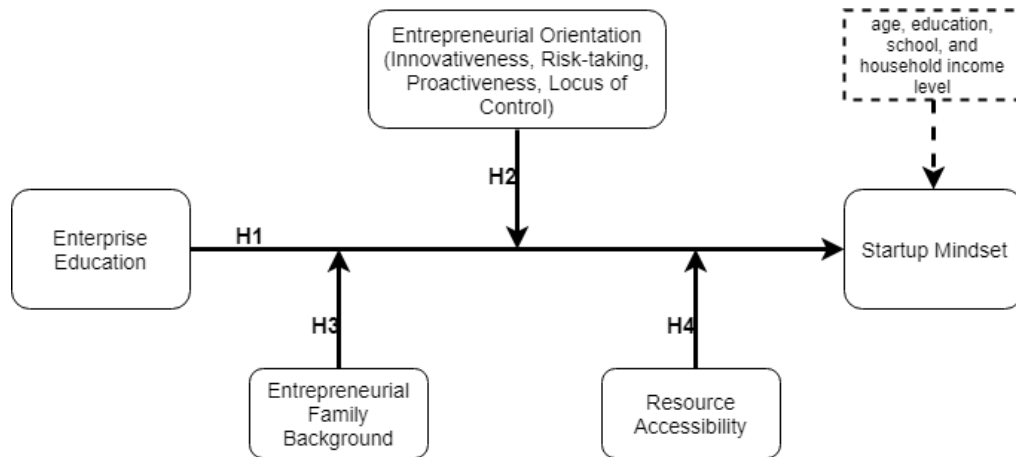


Figure 1. Conceptual model

Methodology

Collecting samples and data

A total of 650 questionnaires were distributed to science and engineering students at Bolgatanga Technical University (BTU) and C. K. Tedam University of Technology & Applied Sciences (CKTUT&AS) between November 2024 and March 2025. Of these, 526 questionnaires were returned, representing a response rate of 80.9%. After data screening, 261 questionnaires were excluded due to missing or incomplete responses, leaving 265 valid questionnaires for the final analysis. Table 1 below elucidates the Demographic Characteristics of the Respondents.

Table 1: Demographic Characteristics of the Respondents (N = 265)

Variable	Category	Frequency (n)	Percentage (%)
Questionnaire Administration	Questionnaires distributed	650	100.0
	Questionnaires returned	526	80.9
	Questionnaires excluded (missing data)	261	49.6*
	Valid questionnaires used for analysis	265	50.4*



Institution	Bolgatanga Technical University (BTU)	90	34.0
	C. K. Tedam University of Technology & Applied Sciences (CKTUT&AS)	175	66.0
	Total	265	100.0
Level of Study	Undergraduate	160	60.4
	Master's	77	29.1
	PhD	28	10.5
	Total	265	100.0
Age Group	Below 25 years	150	56.6
	25–30 years	90	34.0
	31 years and above	25	9.4
	Total	265	100.0
Entrepreneurship Education	Yes	133	50.2
	No	132	49.8
	Total	265	100.0
Family Member is an Entrepreneur	Yes	131	49.4
	No	134	50.6
	Total	265	100.0
Annual Household Income	GH¢50,000–GH¢100,000	122	46.0
	Other income categories	143	54.0
	Total	265	100.0

Measuring variables and processing data

The study used the likelihood of starting a business in the next three years as used by Krueger Jr and Brazeal (1994) and others in empirical studies of startup mindset. The dichotomized yes or no response of starting a business within 3 years was subdivided into starting a business while a student, starting a business immediately after graduation, starting a business within 5 years after employment, starting a business within 5-10 years after employment, starting a business after 10 years of experience, and never starting a business. Enterprise education is a dichotomous measure of whether students have taken enterprise education based on Garavan and O' Cinneide (1994) study that found a positive relationship between participation in enterprise education and venture creation and that students who participated in enterprise education were more likely to start their own business. Entrepreneurial orientation was measured on a Likert 5-point scale by summarizing the items developed by Miller (1983) and others, with three questions for each item. To elaborate the questionnaire, some items were reversed scaled, and after standardization, factor analysis was conducted and the proposed factor variables were used as variables for each item. Entrepreneurial family environment was examined using a dichotomous scale of yes or no to whether there is an entrepreneur in the family within four relatives based Veciana et al. (2005) and others; access to resources was examined using a



dichotomous scale of yes or no to whether there is an entrepreneur in the family within four relatives based on Gnyawali and Fogel (1994).

A total of six items were measured on a Likert 5-point scale, including new business conception, utilization of entrepreneurship support policies and support organizations, and advisory team composition, and factor analysis was used as factor variables. Finally, age, and education, university, household income level was set as control variables to minimize the impact on startup mindset. Education was categorized as undergraduate/graduate, age as 25 or younger/30 or younger/31 or older, university as Bolgatanga Technical University (BTU)/C. K. Tedam University of Technology & Applied Sciences (CKTUT&AS), and household income level as a dummy variable categorized as less than Gh¢10,000 per year/less than Gh¢50,000 per year/more than Gh¢50,000 per year.

Validation of Equivalence

This study uses the same methodology because all questions in the survey are self-reported by the students who are responding to the survey.

This study observed that there was a possibility of common method bias since all the questions were answered by the students who responded to the survey at the same time using self-reporting. To check this, we conducted a Harman's Single Factor Test to determine if common method bias was present. An unrotated exploratory factor analysis (Ahmed & Maruod, 2025) was conducted on all items in the survey to verify the single factor, and seven factors with an Eigen Value of 1 or more were identified, indicating that no dominant general factor was found, and the explanatory power of the first factor was 28.09%, indicating that it was not absolute. Based on these results, it can be concluded that the measurement data of this study was not affected by the same methodology and that the problem of same methodology is not serious enough to distort the results.

Reliability and validity of key variables

The validity and reliability of the variables were checked using factor analysis and Cronbach's Alpha. Factor analysis for each variable was conducted by selecting factors with an eigenvalue of 1 or more, and the factor analysis was clarified using the Varimax method, which is a right-angle rotation. In addition, reliability was checked by checking Cronbach's Alpha, and items that reduce reliability were removed through factor analysis to improve Cronbach's Alpha to an appropriate level as shown in Table 1. The reliability of each variable was above 0.5, which meets the standard of Thanasegaran (2009) that 0.5 to 0.6 is sufficient for social science research like this study.

Table 1. Validity and reliability test results of variables

Variables	Measurement questions	Factor loadings	Cronbach's α
Innovativeness	Bringing new ideas to the table	0.898	0.834
	Creative activity advice	0.888	
	Prefer to do things differently	0.813	
Risk-taking	Pursue high-risk, high-return opportunities	0.844	0.536
	Make bold decisions with insufficient information	0.683	
	Stable Job Preference (Reverse)	0.633	
Proactiveness	Active learning to acquire new knowledge	0.904	0.821
	Strive for leadership in your area of interest	0.839	
	Proactively respond to environmental changes	0.835	
Locus of control	Getting what you want is the result of your hard work.	0.841	0.583
	My life is shaped by my actions	0.841	
	Organize your advisory board	0.777	0.816



Variables	Measurement questions	Factor loadings	Cronbach's α
Resource accessibility	Awareness of startup support policies	0.753	
	Utilize entrepreneurial organizations	0.752	
	Raising initial funding	0.692	
	Build your founding team	0.685	
	Envisioning a business that leverages new technologies/ideas	0.666	

Results and Discussion/Findings

Correlation analysis

As a preliminary step to verify the hypothesis, the correlation analysis of Pearson's correlation coefficient as shown in Table 2 shows that the correlation between each variable is significant at the significance level of 0.01, 0.05, and 0.10, indicating that the independent variable has an impact on the dependent variable, and the control variables also show a correlation with the independent variable and the dependent variable, showing a moderating effect. However, the existence of such a correlation between the variables means that the problem of multicollinearity is expected in the regression analysis, so the VIF (Variance Inflation Factor) was considered to diagnose it.



Table 2 Correlation analysis

Average	Standard deviation	Start up mind set	Enterprise education Training (Courses)	Education (Graduate)	Age (<30)	Age (>30)	Annual Income (<\$100m)	Annual Income (>\$100m)	BTU	CKTUT &AS	Innovation	Risk-taking	Proactiveness	Locus of control	Resources Accessibility	Home Environment (Existence)
2.842	1.313	1														
0.502	0.501	.559**	1													
0.936	0.490	-.073	-.042	1												
0.339	0.474	-.017	-.051	.299**	1											
0.094	0.293	.069	.115*	.398**	-.231**	1										
0.473	0.500	.129**	.194**	-.043	-.077	.162**	1									
0.112	0.316	.117*	.015	-.040	.009	-.117*	-.337**	1								
0.264	0.442	-.143**	-.293**	-.275**	-.159**	-.193**	-.056	-.046	1							
0.283	0.451	.351**	.492**	.022	-.221**	.227**	.086	.114*	-.376**	1						
3.225	0.873	.419**	.200**	.034	-.022	.124*	.063	.113*	-.132*	.193***	1					
2.928	0.705	.370**	.147**	-.111*	.008	-.041	.041	.189**	.002	.088	.362**	1				
3.837	0.713	.432**	.282**	.132**	-.047	.135*	.025	.022	-.142*	.256***	.525**	.296**	1			



4.015	0.681	.082	-.066	.101	.058	.070	-.025	.068	-.128*	.019	.153**	.133*	.253***	1		
2.749	0.705	.440**	.337**	.082	.030	.131*	.114*	.144*	-.046	.247***	.453**	.288**	.403***	.143**	1	
0.494	0.501	.148*	.094	.017	-.088	.017	.038	.089	-.147*	.049	.098	.009	.051	.110*	.110*	1

Notes) Two-tailed tests, * $p < .10$, ** $p < .05$, *** $p < .01$, enterprise education, education, age, annual income, school, and role model are dummy variables.

Hypothesis testing

This study utilized SPSS ver. 26 to test the hypotheses. First, the independent sample t-test was used to check the difference in entrepreneurship intention between students who took enterprise education and students who did not take enterprise education. As a result of the analysis, Levene's assumption of equal variance was confirmed ($F=3.237$, $p=0.073$), and it was confirmed that there was a difference in startup mindset according to whether or not students took enterprise education ($t=10.932$, $p=0.000$). In Table 3, the mean startup mindset of students who took enterprise education was 3.57. This is consistent with the results of previous studies such as Venugopal (2025), who found that there was a significant difference in startup mindset based on whether or not students took enterprise education.

Table 3. Difference between taking enterprise education and intention to start a business

Variables	Average		Standard deviation		T value	P value
	Not attending class	Attend class	Not attending class	Attend class		
Startup mindset	2.11	3.57	1.093	1.089	10.932	0.000***

Note) *** $p<.01$

Table 4 shows the results of testing Hypothesis 1 on the relationship between enterprise education and startup mindset using multiple regression analysis. The explanatory power (R^2) of Model 2 with the independent variable of enterprise education significantly increased to 33.1% compared to Model 1 with only control variables ($R^2=0.146$), indicating that taking enterprise education has a significant effect on entrepreneurship intention while controlling for general characteristics. As a result of the analysis, enterprise education has a positive effect on startup mindset ($\beta=1.312$, $P<.01$), indicating that taking enterprise education improves startup mindset, and Hypothesis 1 is accepted.

The moderating effect of entrepreneurial orientation and environmental factors on the relationship between enterprise education and startup mindset is the core of this study. In order to check the moderating effect of entrepreneurial orientation and environmental factors on the relationship between enterprise education and startup mindset, a hierarchical regression analysis was conducted, and the results are presented in Table 5. The explanatory power of Model 3 with the interaction term of independent variables and moderating variables was 53.1%, which was significantly higher than Model 1 (33.1%) and Model 2 (48.4%) ($p<.01$), confirming the moderating effects of entrepreneurial orientation, entrepreneurial family environment, and resource access. Among entrepreneurial orientation, innovativeness ($\beta = 0.450$, $p<.01$), risk-taking ($\beta = -0.247$, $p<.10$), and proactiveness ($\beta = 0.275$, $p<.10$) were statistically significant, but the control position was not statistically significant, and the environmental factor of entrepreneurial family environment ($\beta = -0.433$, $p<.10$). The results of the hypothesis test for moderating effects confirmed that innovation and initiative among entrepreneurial orientation positively moderate the relationship between entrepreneurial education and startup mindset, so Hypotheses 2-1 and 2-3 are accepted. However, among the risk-taking and environmental factors that suggested positive moderating effects, entrepreneurial family environment was found to have a negative effect rather than a positive effect, so Hypotheses 2-2 and 3 were rejected, and Hypotheses 2-4 and 4 on locus of control and access to resources, which showed statistically insignificant results, were also rejected.

Table 4. Relationship between enterprise education and intentions to start a business

	Model 1				Model 2			
	β	Beta	t	VIF	β	Beta	t	VIF
(Constant)	2.377		12.970***		1.923		11.213***	
Education (graduate)	-0.348	-0.131	-1.813*	1.531	-0.182	-0.069	-1.062	1.552
Age (30 and under)	0.257	0.093	1.335	1.424	0.142	0.052	0.831	1.433
Age (31 and older)	0.297	0.067	0.934	1.530	0.213	0.048	0.753	1.532
Annual income (Gh¢50,000 or less)	0.356	0.137	2.154**	1.179	0.162	0.062	1.090	1.209
Annual income (over Gh¢50,000)	0.533	0.129	2.046**	1.170	0.514	0.125	2.225**	1.170
BTU	-0.038	-0.013	-0.191	1.326	0.147	0.050	0.828	1.347
CKTUT&AS	0.897	.0306	4.519***	1.345	0.262	0.090	1.367	1.600



Entrepreneurship training					1.312	.504	8.288***	1.376
F	6.123***				15.395***			
R ² (Adj.R ²)	0.146 (0.122)				0.331 (0.309)			
R ² Change	0.146				0.185***			

Note) * p<.10, ** p<.05, *** p<.01

Table 5. Adjustment Effect Analysis

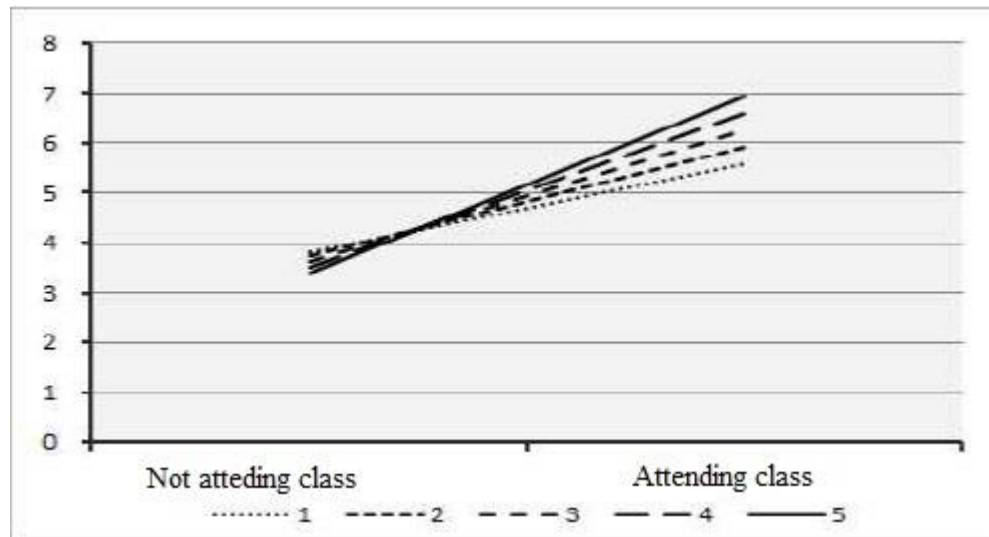
Model Variables	Model 1				Model 2				Model 3			
	β	Bet a	t	VIF	β	Bet a	t	VIF	β	Bet a	t	VIF
(Constant)	1.923		11.213** *		2.099		11.846** *		1.973		10.773** *	
Education (graduate school)	-.182	-.069	-1.062	1.552	-.235	-.088	-1.509	1.615	-.175	-.066	-1.160	1.634
Age (30 and under)	.142	.052	.831	1.433	.159	.058	1.024	1.496	.077	.028	.499	1.563
Age (31 and older)	.213	.048	.753	1.532	.121	.028	.480	1.558	.068	.015	.275	1.577
Annual income (Gh¢50,000 or less)	.162	.062	1.090	1.209	.071	.027	.531	1.240	.058	.022	.445	1.250
Annual income (over Gh¢50,000)	.514	.125	2.225**	1.170	.175	.042	.817	1.267	.261	.063	1.251	1.291
BTU	.147	.050	.828	1.347	.139	.047	.850	1.447	.057	.019	.349	1.529
CKTUT&AS	.262	.090	1.367	1.600	.158	.054	.914	1.645	.059	.020	.347	1.678
Enterprise education (A)	1.312	.504	8.288***	1.376	1.021	.392	6.814***	1.561	1.289	.495	6.754***	2.719
Innovation (B)					.162	.124	2.106**	1.624	-.102	-.078	-.979	3.220
Risk Taking (C)					.218	.168	3.238***	1.265	.354	.272	3.948***	2.402
Proactive (D)					.200	.153	2.587**	1.646	.055	.042	.526	3.224
Locus of Control (E)					.001	.001	.019	1.148	.017	.013	.194	2.296
Access to resource (F)					.146	.112	1.939*	1.575	.155	.119	1.554	2.977
Entrepreneurial family environment (Existence) (G)					.224	.086	1.800*	1.076	.431	.166	2.521**	2.182
A×B									.450	.256	2.946***	3.826
A×C									-.247	-.132	-1.918*	2.398



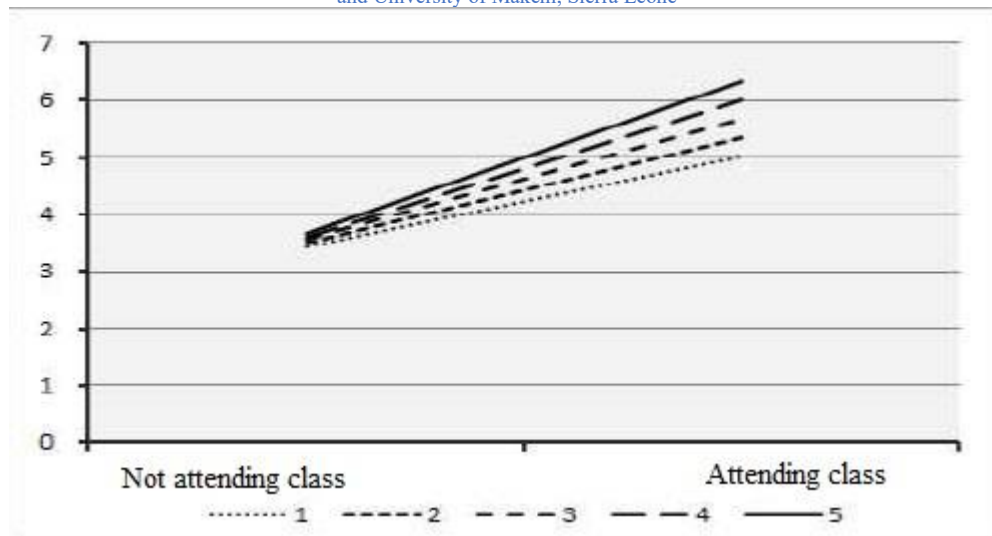
Model Variables	Model 1				Model 2				Model 3			
	β	Bet a	t	VIF	β	Bet a	t	VIF	β	Bet a	t	VIF
A×D									.275	.14 7	1.823*	3.28 3
A×E									-.054	- .02 9	-.436	2.25 3
A×F									-.039	- .02 1	-.265	3.23 5
A×G									-.433	- .14 7	-1.813*	3.32 9
F	15.395***				16.295***				13.398***			
R ² (Adj. R ²)	0.331 (.309)				0.484 (.455)				0.531 (.491)			
R ² Change	0.331				0.153***				0.046***			

Note) * p<.10, ** p<.05, *** p<.01

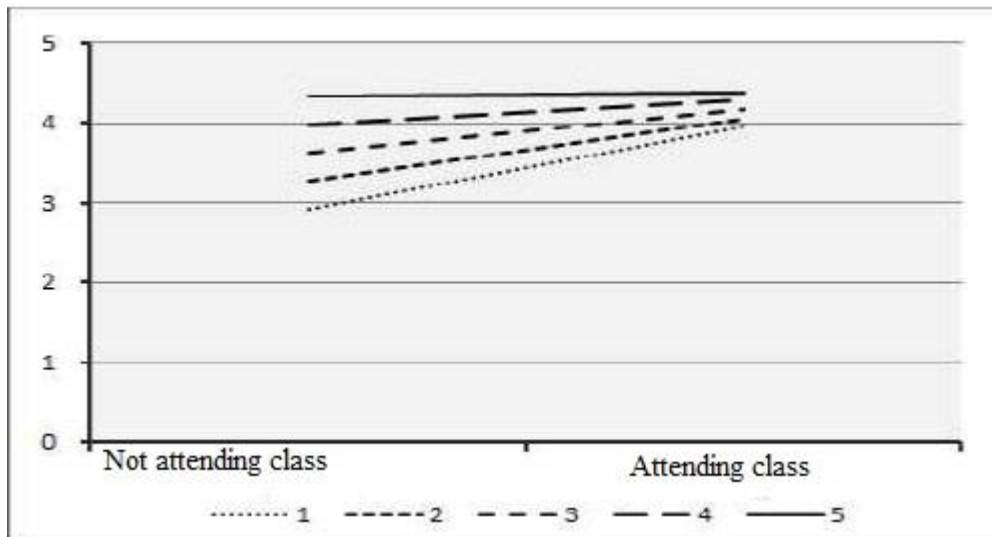
Simple Slope Analysis



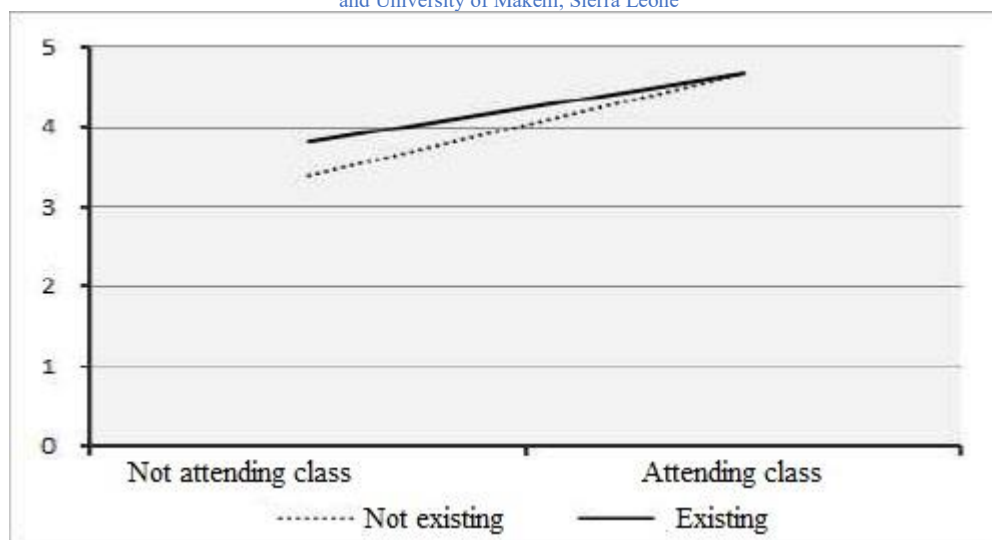
(A. Innovation).



(B. Proactiveness)



(C. Risk Taking)



(D. Entrepreneurial Family Environment)

Figure 3. Simple Slope Analysis

Figure 2 is the result of the Simple Slope Analysis proposed by Aiken & West (1991) to interpret the moderating effect of the significantly identified moderating variables more clearly. If you check the regression line of the independent variable, whether or not you have taken enterprise education, and the values of the control variables, you can see that the slope is different depending on the level of the control variables.

In Figure A and Figure B, we can see that the slope of the regression line increases as innovation and proactiveness increase. This shows that higher innovativeness and proactiveness have a positive moderating effect. On the other hand, risk-taking and entrepreneurial family environment act as buffering moderators that reduce the effect of entrepreneurial education on startup mindset, so that the slope of the regression line decreases as risk-taking increases and in the presence of entrepreneurial family environment, as shown in Figure C and Figure D.

Discussions

This study sought to address an important gap in entrepreneurship education research. Although enterprise education has been widely promoted as a mechanism for stimulating entrepreneurial behaviour, previous empirical findings remain inconsistent regarding whether enterprise education actually strengthens students' startup mindset. Furthermore, earlier studies have paid limited attention to the contextual conditions under which enterprise education is most effective.

The findings contribute to resolving this inconsistency by demonstrating that enterprise education significantly improves startup mindset among science and engineering students in Ghana. Students who had received enterprise education reported significantly higher startup mindset than those who had not, and enterprise education remained a significant predictor even after controlling for demographic characteristics. These results support studies by Porfirio et al. (2022), Benner (2024), and Overwien et al. (2024), which concluded that entrepreneurship education positively influences entrepreneurial intentions. More importantly, the present findings suggest that the inconsistent conclusions reported in previous literature may not necessarily imply that enterprise education is ineffective. Rather, its effectiveness depends on the characteristics of the learners and the environment within which they operate.

The moderating analysis provides the strongest contribution of this study. Previous research largely treated entrepreneurial orientation and environmental factors as direct predictors of startup mindset, leaving unanswered why enterprise education produces strong effects in some studies but weak or negative effects in others. This study demonstrates that entrepreneurial orientation explains part of this inconsistency. Specifically, innovativeness and proactiveness significantly strengthened the positive influence of enterprise education on startup mindset. Students who naturally seek new ideas and proactively pursue opportunities appear to benefit more from enterprise education because they are more capable of translating entrepreneurial knowledge into entrepreneurial aspirations. These findings indicate that enterprise education alone is insufficient; its impact depends on students' readiness to apply what they learn.

Interestingly, risk-taking weakened the relationship between enterprise education and startup mindset, contrary to the hypothesized positive moderation. This finding offers another explanation for the conflicting evidence reported in previous studies. Students with stronger risk-taking tendencies may become more aware of the uncertainties and challenges associated with entrepreneurship after receiving formal enterprise education. Rather than encouraging immediate entrepreneurial intentions, enterprise education may promote more realistic assessments of entrepreneurial risk, leading some students to delay or reconsider business creation. This interpretation helps explain why several earlier studies reported weak or even negative effects of enterprise education.

The negative moderating effect of entrepreneurial family environment was also unexpected. While previous studies generally suggest that entrepreneurial families encourage entrepreneurial intentions, the present findings indicate that students from entrepreneurial families rely less on formal enterprise education to develop startup mindset. Family members may already provide practical entrepreneurial experience, mentorship, business networks, and financial support, reducing the additional value gained from classroom-based entrepreneurship education. Conversely, students without entrepreneurial family backgrounds may depend more heavily on formal enterprise education to acquire entrepreneurial knowledge and confidence. This finding offers a plausible explanation for why enterprise education appears more effective in some populations than others.

Contrary to expectations, locus of control and access to resources did not significantly moderate the relationship between enterprise education and startup mindset. This suggests that although these variables remain important determinants of entrepreneurship, they may not necessarily influence how students convert enterprise education into entrepreneurial intentions. Their effects may instead occur directly or indirectly through other psychological or institutional mechanisms that were not examined in this study.

Overall, this study addresses the central problem identified in the literature by demonstrating that the inconsistent relationship between enterprise education and startup mindset is partly explained by moderating influences rather than by the effectiveness of enterprise education alone. The findings indicate that enterprise education is generally effective in strengthening startup mindset, but its impact varies according to students' entrepreneurial orientation and family environment. Consequently, future entrepreneurship education research should move beyond examining only the direct effect of enterprise education and instead investigate the personal, institutional, and environmental conditions that determine when and for whom enterprise education produces the greatest entrepreneurial outcomes. This provides a more nuanced explanation for the mixed findings reported in previous studies and advances understanding of the mechanisms through which enterprise education influences startup mindset.

Conclusion and Recommendations

Summary of findings and implications

This study examined whether there is a difference in startup mindset according to whether or not students have taken enterprise education, whether enterprise education has a positive effect on startup mindset, and the moderating effects of entrepreneurial orientation and environmental factors on the relationship between enterprise education and startup mindset. The results of the study confirmed that there is a significant difference between the startup mindset of students who have received enterprise education and those who have not, and that taking enterprise education has a positive effect on students' startup mindset. In addition, entrepreneurial orientation and environmental factors have a moderating effect, such that higher innovation and proactiveness increase startup mindset, but risk-taking negatively moderates startup mindset, and entrepreneurial family environment negatively moderates the relationship between enterprise education and startup mindset. These findings contribute to the literature not only by empirically identifying the relationship between enterprise education and startup mindset, but also by providing various theoretical and practical implications.

Theoretical implications

First, in terms of theoretical implications, we empirically confirm the positive relationship between enterprise education and startup mindset, providing support for existing studies that have claimed a positive relationship between enterprise education and startup mindset. By analyzing the relationship between enterprise education and startup mindset through an empirical study of Ghanaian science and engineering students, which has shown inconsistent results so far. The study demonstrate that startup mindset differs depending on whether or not they have taken enterprise education, and that enterprise education has a positive effect on startup mindset. These results provide a theoretical basis for studies that claimed the positive effect of enterprise education and studies that claimed the positive relationship between enterprise education and startup mindset by providing empirical evidence. Second, by introducing and testing moderating variables that have not been addressed in



previous studies, we identified new types of moderating variables. Unlike previous studies, which mainly used demographic characteristics, networks, and cultural factors as moderating variables, this study introduced entrepreneurial orientation and environmental factors such as entrepreneurial family environment and access to resources as moderating variables, which were mainly treated as influencing factors rather than moderating variables in previous studies, and demonstrated the moderating effect. This result has important theoretical implications which suggested the need to identify and expand new types of moderating factors.

Practical implications

This study highlights the significant role of enterprise education in boosting students' startup mindset, emphasizing the need to expand such programs to foster interest and action in entrepreneurship. Additionally, the research examines the moderating effects of entrepreneurial orientation and environmental factors, suggesting necessary adjustments to current educational approaches.

Key findings reveal that entrepreneurial orientation traits like innovation and proactiveness positively influence startup mindset, while risk-taking has a negative effect, potentially leading to risk aversion after theoretical learning. Surprisingly, the entrepreneurial family environment showed a negative moderating effect, contrasting with prior studies. This suggests that students with entrepreneurial family backgrounds may value firsthand experience and family support over formal education, gaining essential resources and capital through their networks rather than classroom learning.

The study underscores the importance of assessing students' individual traits and environmental contexts before designing entrepreneurship programs. Customized curricula, tailored to students' specific needs and backgrounds, can enhance startup mindset more effectively than a one-size-fits-all approach. By integrating theoretical and practical benefits, education programs can better prepare students for successful entrepreneurship. These insights call for a more personalized and adaptive approach to enterprise education, ensuring it meets diverse student needs while maximizing its impact on their entrepreneurial aspirations.

Study limitations and future research directions

This study, while valuable, has several limitations. First, it measures enterprise education and startup mindset at a single point in time, failing to capture how intentions evolve before, during, or after such education. Future research should adopt longitudinal methods to track changes in startup mindset over time.

Second, the study does not assess whether startup mindset translate into actual business creation. A follow-up study linking education, intention, and real-world entrepreneurship is needed to evaluate the true effectiveness of entrepreneurship programs.

Third, the research sample was limited to science and technology students from select Ghanaian universities, restricting comparisons across different educational backgrounds, majors, regions, or countries. Future studies should expand to diverse groups—including middle school, high school, university students, and the general public—to validate the findings across varied demographics.

Fourth, the measurement of "entrepreneurial family environment" was too simplistic, only noting whether a family member was an entrepreneur without defining the scale or type of business (e.g., small self-employment vs. tech startups). Since different entrepreneurial ventures may influence perceptions differently, future research should clearly define and categorize family entrepreneurship.

Lastly, while this study confirms the moderating effects of entrepreneurial orientation, it suggests exploring additional factors, such as curriculum design (subjects, content, structure) and educator traits (enthusiasm, competence), which may further shape the link between education and startup mindset.

Overall, addressing these limitations through longitudinal, comparative, and more nuanced research will enhance understanding of enterprise education's impact and improve its real-world applicability.

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