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Extracurricular Activities as a Mediator Between Education and Entrepreneurial Mindset: Examining the Unobserved Heterogeneity of the Model

Tahar Lazhar Ayed

Department of Management and Marketing, School of Business and Law, Dar Al-Hekma University, Jeddah 22246-4872, Saudi Arabia; tayed@dah.edu.sa

Abstract

This article aims to uncover the nature of the relationship between entrepreneurial program (EP) and entrepreneurial mindset (EM) through the mediating role of students' extracurricular activities (EX). A total of 240 questionnaires were collected from Umm Al-Qura University students and analyzed using SmartPLS 4.0. Validity and reliability were tested to ensure good quality data. The direct impacts of EP and the mediating role of EX on EP were estimated using regression path coefficients. Because the comparison group was unknown in advance, the finite mixture partial least squares (FIMIX-PLS) and partial least squares prediction-oriented segmentation (PLS-POS) approaches were adopted to examine the unobserved heterogeneity of the entire model. After the analysis, two groups were retained. The full data showed weak variance in the two variables. However, segment 2 confirmed high variance in both variables, and segment 1 showed moderate variance in EM but low variance in EX. The results imply that universities should integrate structured EX with formal EP, rather than relying on curricular programs alone, to strengthen the EM. The distinct segment profiles further suggest that a single, uniform intervention is unlikely to serve all students equally; universities should tailor extracurricular opportunities to differing levels of engagement and mindset development.

Keywords: entrepreneurial program; extracurricular activities; entrepreneurial mindset; heterogeneity; FIMIX-PLS; PLS-POS

1. Introduction

The Fourth Industrial Revolution (Industry 4.0) and the COVID-19 pandemic have accelerated global labor market disruptions, creating unprecedented challenges for workforce readiness. According to recent research, automation is expected to displace some jobs by 2030, while many others will require reskilling. Consequently, new graduates will need to develop analytical and critical thinking, problem-solving, digital and data-analytics skills, and creativity (Chandar et al., 2025; Willcocks, 2024). This transformation underscores a widening skills gap as technological advancements outpace individual adaptation (Li, 2024/2022; Rikala et al., 2024). Future-ready professionals must cultivate competencies such as critical thinking, problem-solving, creativity, adaptability, resilience, and effective communication to thrive in this dynamic environment (Azofeifa et al., 2024).

Entrepreneurship education has emerged as a strategic response to these challenges, equipping students with cognitive and behavioral skills essential for navigating uncertainty. An EM, defined by opportunity recognition, innovation, and proactive problem-solving, is

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increasingly recognized as a critical asset for success in the knowledge economy (Alkaabi & Senghore, 2024). EP provides students with the rationality, motivation, and experiential learning needed to embrace entrepreneurial culture and develop resilience (Handayati et al., 2020; Wang et al., 2022).

However, recent research emphasizes that EX, such as startup clubs, hackathons, and social entrepreneurship initiatives, play a pivotal role in complementing formal curricula. ECAs foster social leadership, creativity, and entrepreneurial intention by offering informal, experiential learning opportunities (Maragh, 2024; Nguyen et al., 2026). In the GCC region, where entrepreneurship is a national priority, integrating ECAs into university ecosystems can catalyze cultural and educational transformation (Sobh et al., 2025).

Entrepreneurship education has become a central focus in higher education reform, particularly in countries such as Saudi Arabia, where innovation and youth empowerment are national priorities under Vision 2030 (Ikram, 2024; Montash et al., 2024). Universities increasingly implement both formal curricular programs and EX to foster EM; however, empirical research remains limited on how these components interact to shape students' cognitive and behavioral outcomes (Maragh, 2024; Nguyen et al., 2026). Specifically, the mediating role of ECAs in the relationship between structured EP and the development of EM has not been sufficiently explored (Fauchald, 2025; Sun et al., 2023). This gap poses challenges for universities aiming to create integrated, student-centered ecosystems that enhance entrepreneurial competencies (Jurgelevičius et al., 2025; Villegas-Mateos & Amann, 2025). Accordingly, this study investigates how student engagement in both curricular and EX influences the development of an EM. It further examines the relative contribution of formal and informal learning environments to students' critical and creative thinking skills and evaluates the extent to which ECAs mediate the impact of EP on mindset formation (Pukkinen et al., 2023/2026; Sun et al., 2024).

The motivation behind this research stems from the growing imperative to empirically investigate the role of EX in fostering entrepreneurial competencies among students. Recent studies confirm that EX significantly enhances entrepreneurial intention, self-efficacy, and mindset development, complementing formal education (Isac et al., 2023; Maragh, 2024; Pukkinen et al., 2023/2026). In the context of Saudi Arabia's economic diversification agenda, entrepreneurship education has emerged as a strategic priority for universities aiming to cultivate innovation-driven graduates and align with Vision 2030 goals (Ahmad et al., 2023; Montash et al., 2025). Despite the increasing integration of entrepreneurial initiatives into academic environments, there remains a critical need to validate how non-curricular engagements contribute to skill development, particularly in informal learning settings that promote creativity and leadership (Nguyen et al., 2021; Toh et al., 2025). This study is therefore driven by the opportunity to generate evidence-based insights that can guide both policymakers and higher education institutions in enhancing the design, implementation, and impact of EP, ultimately aligning academic efforts with national economic goals (Alkrdem, 2025; Yusuf & Atassi, 2024).

This study offers several key contributions to the entrepreneurship education literature. First, it develops and empirically tests a mediated model that explores the interplay between EP, EX, and the EM, thereby advancing theoretical understanding of how these elements interact within academic contexts. Second, by employing unobserved heterogeneity analysis, the research identifies distinct subgroup patterns among students, revealing nuanced dynamics often overlooked in aggregate-level studies. Third, the study provides practical implications for Saudi higher education institutions by highlighting the importance of integrating both curricular and extracurricular strategies to cultivate entrepreneurial thinking and behavior among students, aligning educational practices with national goals for innovation and economic diversification.

This study examines the following areas in order to look at all of the aforementioned difficulties. The elements included in the model, EP, EX, and EM, are first discussed theoretically. Second, the model's various links will be developed in outline form. The sample, technique, and outcomes will all be described in the third section. Fourth, there will be a discussion of the conclusions and their consequences. The conclusion will include restrictions as well as opportunities for new perspectives and open research.

2. Context of Study and Saudi Arabia Vision 2030

The proposed research model seeks to clarify the complementary roles of formal classroom instruction and non-formal experiential learning in developing students' entrepreneurial mindsets. Formal entrepreneurial programs can provide foundational business knowledge; however, knowledge acquisition alone may be insufficient to develop an entrepreneurial mindset. Although previous studies have examined extracurricular activities as independent predictors of entrepreneurial outcomes, their role as a mediating mechanism linking formal entrepreneurial programs to entrepreneurial mindset warrants further empirical investigation (Nguyen et al., 2021; Ayed et al., 2026).

Saudi Arabia provides a relevant socioeconomic context for examining this relationship. Within the framework of Saudi Vision 2030, economic diversification and the development of entrepreneurial capabilities create a need to understand how education connects theoretical knowledge with practical experience. The central question is therefore not simply whether entrepreneurial programs provide relevant knowledge, but whether they encourage and foster learning by doing and whether extracurricular participation helps explain their relationship with EM (Ayed, 2020; Ayed et al., 2026). Universities and other educational institutions have an important role in preparing students to participate in an increasingly competitive and changing professional environment. Connecting formal entrepreneurial programs with extracurricular learning opportunities may help students apply classroom knowledge, engage with practitioners, and gain experience beyond academic settings. Examining these connections is relevant to educational efforts aligned with the broader objectives of Saudi Vision 2030, particularly the development of capabilities that support innovation and participation in a diversified economy (Ayed et al., 2026).

Accordingly, this study examines extracurricular activities as a proposed mediator of the relationship between entrepreneurial programs and entrepreneurial mindset among Saudi university students. It seeks to determine whether participation in activities beyond the formal curriculum helps explain the association between entrepreneurial programs and students' mindset. The findings may inform recommendations for strengthening connections between classroom instruction and experiential learning, thereby supporting the design of entrepreneurship education that is responsive to students' developmental needs and the Saudi context (Cui & Bell, 2022; Hammoda, 2023; Ayed et al., 2026).

3. Theoretical Framework

Social Cognitive Theory (SCT) posits that human functioning is shaped by the dynamic interplay of personal factors, environmental influences, and behavior. Developed by Bandura (1982), SCT highlights the importance of observational learning and self-efficacy, the belief in one's ability to achieve specific goals. In the entrepreneurial context, SCT and its extension, Social Cognitive Career Theory (SCCT), have been widely used to explain how self-efficacy, attitudes, and contextual factors influence entrepreneurial intentions and actions. Individuals are more likely to pursue entrepreneurial ventures when they believe they possess the necessary skills and can overcome challenges, with self-efficacy serving as a key mediator between education, mindset, and entrepreneurial outcomes (Bandura, 1982).

Mindset is a person's way of thinking about their abilities and potential (Table 1). People with a growth mindset believe that their abilities can be developed and improved with effort. Dweck (1999) found that people with a growth mindset are more motivated to succeed than people with a fixed mindset. They are positively related to creative self-efficacy and creative personal identity and are more likely to respond to failure by focusing on actions and strategies for improvement. They are also less likely to blame themselves for failure and are more likely to show an increase in performance (Karwowski, 2014; Nordin & Broeckelman-Post, 2019). However, entrepreneurs with a growth mindset are more likely to succeed in uncertain environments. They are also more likely to identify and seize opportunities, to adapt to change, to grow and succeed and to develop the economy. Moreover, EM is often seen as a way of thinking that promotes flexibility, creativity, innovation, and renewal. Finally, EM is often seen as a way of thinking that encourages individuals to take action and to continuously improve their skills and knowledge (Davis et al., 2016; De Villiers Scheepers et al., 2018; Ireland et al., 2003; McGrath & MacMillan, 2000; McMullen & Kier, 2016) (Table 1).

Table 1. Definitions.

Concepts	Definitions	References
Entrepreneurial program (EP)	The entrepreneurial knowledge, competencies, motivation, and awareness of students through teaching and learning approaches that prepare them to engage earlier and recognize business opportunities.	Handayati et al. (2020); Wang et al. (2022); Fayolle and Gailly (2008); Ilonen and Heinonen (2018); Ratten and Usmanij (2021).
Extracurricular activities (EX)	Learning activities by doing to connect classroom learning with real-life practices to develop entrepreneurial competencies and	Bodolica et al. (2021); Arranz et al. (2017); Nguyen et al. (2021, 2026).
Entrepreneurial mindset (EM)	A way of thinking of the student to become characterized by opportunity recognition, innovation, and proactive problem-solving.	Alkaabi and Senghore (2024); Davis et al. (2016); De Villiers Scheepers et al. (2018); Ireland et al. (2003); McGrath and MacMillan (2000); McMullen and Kier (2016).

Modeling the EM can help researchers understand how people think and how their intellectual abilities affect their motivations (Dweck, 1999). Some authors define the EM asa tendency that enhances critical and creative thinking capabilities of entrepreneurs (Hui & Leung, 2025; Ndou et al., 2016). People with a developed mindset can change their behaviors and shift their focus to actions and competency improvement. Moreover, people with a growth mindset can develop creative self-efficacy and a creative personal identity (Hultén & Tumunbayarova, 2020; Murphy & Dweck, 2016). Paying attention to the program content and improving student-centered approaches will allow learners to gain experiences and enhance their EM (Ndou et al., 2016). However, many scientific studies have revealed that the impact of EP on EM is nascent and should be clarified.

The mediating role of students' EX was tested to clarify the nature of the relationship between EP and EM. EX allows students to develop their social competencies, enhance critical skills, and increase their academic achievements. Furthermore, unobserved heterogeneity can be a good contribution to the validity of the results and the completeness of the model analysis (Hair et al., 2021). All the data were analyzed using SmartPLS 4 and SPSS 27.0 software.

3.1. EP and EM

EP is vital, but there is no consensus on the optimal techniques, contents, and pedagogical methods (Blenker et al., 2011; Fallatah & Ayed, 2023; Fayolle, 2005). Some opinions emphasize the relevance of learning initiatives where students experience and conduct real

jobs to improve entrepreneurial abilities and behavior (Morris et al., 2013; Schelfhout et al., 2016). According to the work of Ayed (2020), education employs diverse approaches to raise young entrepreneurs' awareness of entrepreneurial opportunities and foster innovation. However, teaching methods must be continually updated to develop the competencies needed to establish new businesses, use resources effectively, and translate new ideas into entrepreneurial initiatives (Fayolle & Gailly, 2008; Ilonen & Heinonen, 2018; Kubberød & Pettersen, 2017; Ratten & Jones, 2021; Ratten & Usmanij, 2021; Sarasvathy, 2001). Additionally, University EP impacts the EM as it enhances the inspiration of students by augmenting their cognitive and emotional mechanisms through improving their abilities of opportunity recognition and critical thinking. Using the competence-based teaching model at university can be an important determinant of EM (Colombelli et al., 2022; Cui, 2021; De La Gala-Velásquez et al., 2024). Since entrepreneurial education is important in enhancing the mindset of young entrepreneurs, we propose the first hypothesis:

H1. *EP contributes significantly to the development of EM of future entrepreneurs.*

3.2. Mediating Role of University EX

Therefore, universities should be equipped with curriculum and EX, which are two basic sources of learning experiences and help to improve competency-building, professional networking, and entrepreneurial readiness (Pittaway et al., 2011; Toutain et al., 2017). However, their effects are unequal. Formal curriculum reduces tolerance for ambiguity (Peterman & Kennedy, 2003), whereas EX provide a collective and organized learning context that helps students to learn, collaborate with each other and foster the development of their competencies and skills in innovation (Bodolica et al., 2021). EX such as guest speakers, business plan competitions, entrepreneurship incubator projects enterprise-oriented training and networking in a supportive environment, are incentives to the motivation and cultivation of students' EM (Arranz et al., 2017; Ayed et al., 2026; Kolympiris & Klein, 2017; Souitaris et al., 2007; Williams Middleton et al., 2020). They connect EP with real life and equip students with practices and reflective experiences that reinforce the EM (Nguyen et al., 2021; Nguyen et al., 2026).

This literature leads us to the next hypothesis:

H2. *EX plays a significant mediating role in the relationship between EP and EM.*

4. Methodology

The conceptual model in Figure 1 illustrates the main relationships examined in this study. As proposed in H1, the model tests the effect of EP on EM. It also incorporates EX as a mediating variable to examine the extent to which EX explains the relationship between EP and EM (H2).

As previously stated, three variables were employed in this study. To predict the model, questions were developed and scored on a five-point Likert scale from 1 (I totally disagree) to 5 (I totally agree). A total of 240 valid questionnaires were retained, and 47 were rejected due to invalidity and incompleteness. Only active students from the schools of Business, Engineering, Medicine, and social sciences at Um Al-Qura University were interviewed using the snowball sampling method for data collection. Students who were interviewed were informed that their responses would be analyzed confidentially and solely for the purposes of the study.

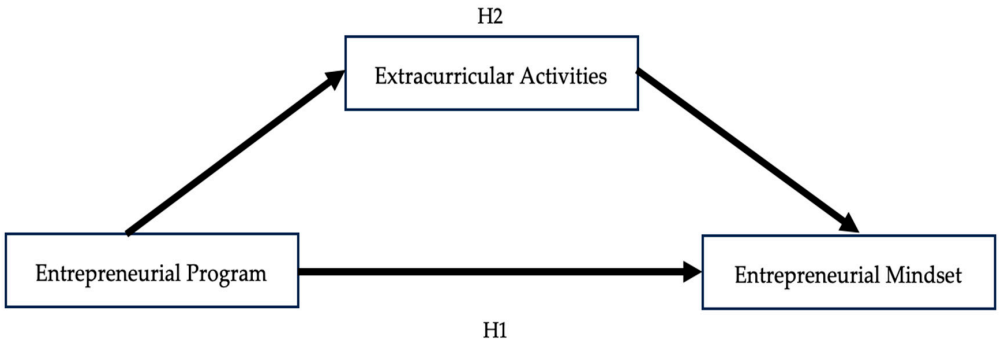


Figure 1. The conceptual framework.

A questionnaire comprising five sections was administered. The first part concerns sociodemographic information, including gender (1 = Male; 2 = Female); age (1 = younger than 20; 2 = 20–25; 3 = 25–30; 4 = older than 30); field of study (1 = nonbusiness; 2 = Business); and academic level (first and second year [2 years] = 1; third and fourth year [4 years] = 2). Other questions related to the respondents were administered: "I had a parent who previously started a business" (No = 1; Yes = 2); "I have many friends close to me who have created their own business" (No = 1; Yes = 2); "I had worked for a small or new company" (No = 1; Yes = 2); and "I had started a business" (No = 1; Yes = 2). These control variables help us understand the EP–EM connection more deeply. The profiles of the surveyed students are detailed in Table 2.

Table 2. Description of the sample.

Profile	Measures	Frequency	Percentage
Received	-	287	-
Valid	-	240	83.6
Gender	Male	125	52.1
	Female	115	47.9
Age	<20	30	12.5
	≥20–25	197	82.1
	>25–30	12	5
	>30	1	0.4
Education level	≤2 years	88	36.7
	>2 years	152	63.3
Field of study	Bus.	179	74.6
	N-Bus.	61	25.4
I had a parent who previously started a business	No	89	37.1
	Yes	148	61.7
I have many friends close to me who have created their own business	No	112	46.7
	Yes	127	52.9
I had worked for a small or new company	No	163	67.9
	Yes	77	32.1
I had started a business	No	208	86.7
	Yes	30	12.5

The other parts of the questionnaire contained information about EP, students' EX, and the EM.

5. Results

A quantitative approach was applied using the PLS-SEM technique (SmartPLS software) to analyze data. The latter works efficiently with limited sample sizes because it reduces error variances. In the first step, the construct measurements' reliability and validity were examined using some indicators (Cronbach's alpha and composite reliability were used to assess reliability; HTMT was used to assess discriminant validity; and AVE was used to evaluate convergent validity). All unsuitable items with low outer loadings were excluded (Hair et al., 2021).

In the second step, a bootstrapping test was conducted to test the structural links among the three variables: EP, EM, and EX. Furthermore, indirect effects were examined to determine whether significant mediation exists. To examine if respondents were heterogeneous in their perceptions and evaluations, the unobserved heterogeneity of the whole model was analyzed. Because the comparison group was unknown in advance, this is known as an unobserved heterogeneity analysis (Hair et al., 2023). This analysis was carried out using the FIMIX-PLS and PLS-POS approaches.

5.1. PLS-SEM Algorithm

As the first stage of analysis, the PLS-SEM approach focuses on examining the quality of the estimates to prepare them for advanced structural analysis. Evaluating the constructs' reliability and validity is important to ensure that all items are accurate. In this work, constructs were measured reflectively, as shown in Figure 1. This means that the constructs explain the items. The reflective measurement model requires checking the internal consistency reliability (e.g., Cronbach's alpha and composite reliability), convergent validity (e.g., average variance extracted (AVE)), and discriminant validity (e.g., Heterotrait–Monotrait (HTMT) ratio). This is an important stage before moving to structural analysis (Hair et al., 2023). Tables 3 and 4 summarize all results related to reliability and validity evaluations.

Outer loadings are useful for determining the relationships between a construct and its items. Only outer loadings greater than 0.7 were retained in this case; EX2, EM2, and EM3 were eliminated from our model because their values were less than 0.7 (Hair et al., 2021). Cronbach's alpha and composite reliability are useful measures for assessing reliability. They determine whether the items assigned to each construct are consistent and reliable. In other words, do the items accurately measure their latent variables (constructs)? Table 3 shows that the constructs' Cronbach's alpha and composite reliability values were above the threshold required (0.7), thus confirming the reliability of all estimates' measures (Hair et al., 2021). Regarding the convergent validity, AVE values for all constructs were above 0.5 (AVE[EP] = 0.696; AVE[EX] = 0.582; and AVE[EM] = 0.576). This indicates that all items correlated well with their assigned construct. Table 3 shows that all the values were satisfactory.

In addition, Table 3 shows that the variance in EM is best explained by the two variables EP and EX and that R^2 is approximately 21%. However, the variance in EX is considered weak and nonsignificant because it is under 10% (EP explains about 6% of the variance).

To ensure discriminant validity, we must check whether each construct differs from another. The HTMT values shown in Table 4 demonstrate that all values were less than 0.9, which confirms the discriminant validity (e.g., [EP-EM] = 0.222; [EX-EM] = 0.539).

Table 3. Reliability and convergent validity.

Variables	OL	Cr	α	AVE	R^2
Entrepreneurial Program (EP) (adapted from Walter and Block (2016))					
My school education program helped me develop my sense of initiative—a sort of entrepreneurial attitude (EP1)	0.806	0.902	0.855	0.696	-
My school education program helped me to better understand the role of entrepreneurs in society (EP2)	0.818				
My school education program made me interested in becoming an entrepreneur (EP3)	0.871				
My school education program gave me skills and competences that enable me to run a business (EP4)	0.841				
Extracurricular activities (EX) (Adapted from Pittaway et al., 2011; Shirokova et al., 2017; Ozaralli & Rivenburgh, 2016; Saeed et al., 2015)					
I am active in the creation and management of the student association (EX1)	0.738	0.847	0.766	0.582	6%
I watch regularly cultural TV shows and documentaries on entrepreneurship (EX3)	0.776				
I regularly participate in entrepreneurial activities and events (EX4)	0.828				
I regularly participate in entrepreneurial trainings outside the university (EX5)	0.705				
Entrepreneurial Mindset (EM) (Adapted from Martinsen, 2011; Bandera et al., 2018; McGee et al., 2009)					
I can shape whatever environment in which I find myself operating (EM1)	0.726	0.871	0.816	0.576	21%
In general, I am willing to take risks (EM4)	0.735				
Generally, when facing difficult tasks, I am certain that I will accomplish them (EM5)	0.725				
My life is determined by my own actions, not by others or by chance (EM6)	0.819				
I like situations in which I compete with others (EM7)	0.784				

Note: N = 240; OL = Outer Loadings, Cr = Composite reliability; α = Cronbach's alpha; AVE = Average variance extracted; R^2 = Coefficient of determination.

Table 4. Heterotrait–Monotrait ratio: Discriminant validity.

	EP	EM	EX
EP	-	-	-
EM	0.222	-	-
EX	0.277	0.539	-

EP: Entrepreneurial program; EX: Extracurricular; EM: Entrepreneurial mindset.

5.2. PLS-SEM Bootstrapping

A bootstrapping PLS-SEM with 1000 subsamples was used to evaluate the model's structural links. Table 5 presents the results of the direct linkage experiments. The regression weights (Original Sample [O]) for each impact can be used to determine the importance of the impact.

The results of the variable analysis in Table 5 show that EP has a significant impact on students' EX (p-value = 0.000; (O) = 0.244). Moreover, EX significantly affected EM (p-value = 0.000; (O) = 0.429). However, EP did not significantly explain EM because the p-value was over 0.05 (p-value = 0.254; (O) = 0. 079).

Table 5. Path coefficients.

	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	*p* Values	Hypothesis	f^2
EP → EM	0.079	0.069	1.142	0.254	H1 Not supported	0.007
EP → EX	0.244	0.057	4.269	0.000 ***	-	0.063
EX → EM	0.429	0.059	7.293	0.000 ***	-	0.218
EP → EX → EM	0.105	0.030	3.548	0.000 ***	H2 supported	-

Notes: ***: sig < 0.01; Original Sample (O): path coefficients; f^2: Contribution of the independent variable to explaining the dependent variable.

Finally, the results reveal that EP positively and significantly affected EM through students' EX (p-value = 0.000; (O) = 0.105). This means that EX played a mediating role between EP and EM. This mediation was classified as full because the direct effect was not significant (Zhao et al., 2010).

Furthermore, the effect size (f^2) shows how strongly independent variables can contribute to explaining dependent variables. Among the three significant effects, EP appears to have a weak effect on EX, as the f^2 is between 0.02 and 0.15 ($f^2 = 0.063$). EX had a medium impact on EM, as the f^2 is between 0.15 and 0.35 ($f^2 = 0.219$) (Cohen, 1988).

5.3. PLS-Predict

The main objective of PLS-Predict is to evaluate how well the PLS-SEM model predicts outcomes. It is not an explanation of the data used, but it helps to evaluate out-of-sample predictive performance. In this model, PLS-predict will not test the relationship between EP and EM and EX and EM. It is about asking if the model can predict entrepreneurial mindset and extracurricular-activity outcomes.

Stone-Geisser's Q^2 values are assessed to examine the model's predictive relevance (Geisser, 1974; Stone, 1974). As demonstrated in Table 6 above, the Q^2 values exceeding 0, along with the positive values for RMSE (Root Mean Square Error) and MAE (Mean Absolute Error), provide evidence for the predictive validity of the proposed research model (Woodside, 2013; Roldan & Cepeda, 2017).

Table 6. PLS-predict.

	Q^2predict	RMSE	MAE
EM	0.029	0.990	0.745
EX	0.104	0.955	0.776

5.4. Unobserved Heterogeneity

The PLS-SEM approach was used to estimate uncovered segments for EM modeling to identify group differences based on the research model developed above. The first technique used was finite mixture partial least squares (FIMIX-PLS) (Hahn et al., 2002; Sarstedt et al., 2011).

5.4.1. FIMIX-PLS Procedure and Number of Segments

To determine the ideal number of segments to be retained, we must examine the fit indices for each number of groups. The FIMIX-PLS analysis was run from 2 to 5 segment

solutions to determine the number of segments to be considered (Table 7). The sample size for each segment of each solution should be checked (Hair et al., 2023).

Table 7. Fit indices for one- to five-segment solutions.

	Number of Groups			
Criteria	**2**	**3**	**4**	**5**
AIC (Akaike's information criterion)	1301.969	1302.748	1307.727	1307.478
AIC3 (Modified AIC with Factor 3)	1312.969	1319.748	1330.727	1336.478
AIC4 (Modified AIC with Factor 4)	1323.969	1336.748	1353.727	1365.478
BIC (Bayesian information criterion)	1340.256	1361.919	1387.781	1408.416
CAIC (Consistent AIC)	1351.256	1378.919	1410.781	1437.416
MDL5 (Minimum description length with Factor 5)	1581.404	1734.602	1892.000	2044.170
LnL (LogLikelihood)	−639.984	−634.374	−630.863	−624.739
EN (Entropy statistic (Normed))	0.631	0.578	0.566	0.621

To determine the optimal number of segments, we consider the lowest value for each fit measure, except the EN indices, wherein a higher value indicates good group differentiation (Hair et al., 2023). Many indices can be used to choose the retained number of groups. AIC3 and CAIC, AIC3 and BIC, and CAIC and MDL5 indicate that two segments are the ideal number to be retained. Thus, all the indices point to the same decision. The EN value of 0.631 confirmed that the two groups are the most distinct from one another. In sum, when using the FIMIX-PLS tool to determine the best number of segments, consider not only these criteria but also the practicability, parsimony, and manageability of each segment (Sarstedt & Mooi, 2014; Sarstedt et al., 2009).

The solution of two segments showed the first group with 88.5% (212 respondents) of the sample and the second group with 11.5% (28 respondents) (Table 8).

Table 8. Relative segment sizes.

Number of Segments	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5
2	0.885	0.115			
3	0.759	0131	0.110		
4	0.697	0.114	0.099	0.090	
5	0.659	0.123	0.084	0.080	0.054

Compared with the full dataset, the R^2 of EM is considerably higher in segment 2 but lower in segment 1. However, the R^2 of EX in the full dataset (6%) is slightly different from the R^2 in segment 1 (5.3%), but the R^2 in segment 2 increases to 11.2%. This partition showed that the R^2 values of segment 1 are lower than those detected in the full dataset. However, the R^2 values of segment 2 are higher than those detected in the full dataset (Table 9).

Table 9. FIMIX-PLS R^2 values for the two-segment solution.

	R^2 Values		
	Full Dataset	**Segment 1**	**Segment 2**
EM	0.207	0.158	0.898
EX	0.060	0.053	0.112

The segmentation supports the conclusion regarding the number of segments retained. Full data showed weak variance in the two variables. However, segment 2 confirmed high variance in both variables, whereas segment 1 showed moderate variance in EM but low variance in EX.

5.4.2. PLS-POS Procedure

To overcome the limitations of the FIMIX-PLS technique, a second promising alternative known as prediction-oriented segmentation (PLS-POS) was used. This technique reduces the variance in the FIMIX-PLS segment solution (Becker et al., 2013). Segment 1 comprised 131 respondents, whereas segment 2 comprised 109, as shown in Table 10.

Table 10. PLS-POS solution and weighted average R^2 values.

	R^2 Values			**PLS-POS Weighted Average R^2 Values**
	Full Dataset	**Segment 1 (131)**	**Segment 2 (109)**	
EM	0.207	0.528	0.624	0.572
EX	0.060	0.062	0.082	0.071

As we can see, compared with the outcomes of the weighted average R^2 values of the full dataset, the weighted average R^2 values of the two segments are considerably higher. These results are deemed desirable for segmentation. The PLS-POS analysis showed that EP has a positive impact on EM, whereas in segment 2, it has a negative impact. The difference between segments 1 and 2 in the relationship between EP and EX is considered low. Finally, in segment 2, the impact of EX on EM is considered to be higher than that in segment 1 (Table 11).

Table 11. Path coefficients of the full dataset and two PLS-POS segments.

	Full Dataset	**Segment 1**	**Segment 2**	**Segment 1–Segment 2**
EP → EM	0.079	0.628	−0.533	1.161
EP → EX	0.244	0.248	0.287	−0.039
EX → EM	0.429	0.241	0.755	−0.546

6. Discussion

Our research validated the important role of EX in the mediation between an EP and an EM, which in turn facilitates the integration of knowledge and experience in the environment of learning (İleritürk, 2023). It appears that EP alone cannot play an important role in developing the EM of young and future entrepreneurs. EX at universities serve as an incubator for aspiring entrepreneurs. These programs provide a safe space for students

to experiment with nascent business ideas, hone their entrepreneurial skillset, and gain valuable insights from trial-and-error experiences (Bodolica et al., 2021). This aligns with the growing recognition of universities' crucial role in fostering social change.

6.1. Theoretical Implications

There are a number of reasons why EP alone may not be enough to develop the EM of young and future entrepreneurs. EP typically focuses on the technical aspects of starting and running a business, such as business planning, marketing, and financial management. However, it does not typically address the non-technical aspects of entrepreneurship, such as creativity, risk-taking, and innovation. EP is often delivered in a classroom setting. This can be a challenging environment for some students, as it can be difficult to apply the theoretical concepts of entrepreneurship to real-world situations. Therefore, it is important to consider other factors that can contribute to the development of the EM of young and future entrepreneurs, such as personal experiences (e.g., those starting their own businesses or working for small businesses are more likely to develop an EM). Moreover, learners must be exposed to role models who are entrepreneurs.

Our research contributes to extending the theory of planned behavior (TPB) and the entrepreneurial event model (EEM) by suggesting that entrepreneurial attitudes, perceived feasibility, and perceived behavioral control do not develop through exposure to lectures alone. Rather, active engagement and experiential learning may help bridge the gap between formal knowledge and these psychological antecedents of entrepreneurial behavior (Alshebami, 2026).

6.2. Empirical Implications

By offering supportive and learning-oriented environments, universities can empower students to test-drive social initiatives. This fosters the development of social entrepreneurship qualities and skills, ultimately equipping students to become effective agents of positive social change (Bodolica et al., 2021). A growing concern among industry leaders is the perceived gap between the skills universities equip graduates with and the practical demands of the modern workplace (Griffin & Coelhoso, 2019). In response, universities have implemented mandatory credited internship programs, typically lasting a semester, as a graduation requirement. While internships offer undeniable value by exposing students to real-world problems, this paper argues that participation in EX can also significantly contribute to the development of essential employability skills (Bodolica et al., 2021).

According to Kocayiğit and Ekinci (2020), EX inspires teachers and students and helps them improve their interactions with one another. EX aids in behavioral and social development, which in turn supports the growth of interpersonal communication abilities. Most studies have demonstrated how stakeholders and external parties outside the university might participate actively in the development of social entrepreneurship education. The educational experience of the students would be of high practical value. Since EX are crucial in helping students develop their managerial skills, authors come to the conclusion that they should be seen as a useful supplement to entrepreneurship education (Bodolica et al., 2021).

EX are activities that students participate in outside of the classroom. These informal activities can provide students with opportunities to gain practical experience, learn new skills, and develop their talents. Career guidance is the process of helping students explore their interests, identify their skills, and make informed decisions about their future careers. The combination of EX and career guidance can help students to develop the skills and knowledge they need to be successful in their chosen careers (Muscalu & Dumitrascu, 2014).

Students can learn how to work independently, solve problems, and communicate successfully through EX, including business clubs, debate teams, robotics teams, scientific

fairs, guest lecturers, field trips, etc. These activities can also help students develop their creativity, confidence, and self-esteem. Moreover, by providing students with a variety of EX and opportunities to learn about entrepreneurship, schools may help students realize their potential as entrepreneurs. The goal of EX is to foster the ability to overcome obstacles, adjust to changing circumstances, and be flexible and adaptable in society. The capacity to mentor and coach other students and alumni is one of the many avenues for sharing information about entrepreneurship that EX creates (Firmansyah et al., 2020).

Universities provide students with a variety of EX that support the growth of their social leadership skills and entrepreneurial prowess, according to Powell and Walsh (2018). They offer a setting where students can develop and explore without worrying about the results.

EP alone may not be sufficient to develop an EM among young and future entrepreneurs. These programs often focus on technical skills, such as business planning, marketing, and financial management. However, they may pay less attention to creativity, risk-taking, and innovation. In addition, EP is often taught in classrooms, where students have limited opportunities to apply what they learn in real business situations. Therefore, developing EM also requires practical experience and exposure to real entrepreneurs. For example, starting a business or working in a small company can help students develop an entrepreneurial mindset. Learning from successful entrepreneurs who serve as role models can also strengthen their EM.

7. Conclusions

This study examined how EP and EX are jointly related to EM among Saudi university students, clarifying the relationship between EP and EM by testing the mediating role of EX. Situated within Saudi Arabia's emphasis on capability development and economic diversification under Vision 2030, the research addresses the need to connect entrepreneurial education with opportunities for practical engagement. The framework developed in this article positions EP as an important component of the educational environment, helping students acquire knowledge and access opportunities to participate in entrepreneurial activities. EX, in turn, provides a potential link between this environment and students' entrepreneurial mindset. The empirical findings support full mediation through EX: the direct relationship between EP and EM was not statistically significant, whereas the indirect relationship between EP and EM through EX was statistically significant. Additionally, the PLS-POS analysis showed that the relationship between EP and EM varied across segments, with positive associations in some segments and negative associations in others. This pattern suggests that EP may function as a double-edged sword by increasing students' awareness of entrepreneurship in different ways. For some students, greater awareness may encourage interest in launching a business. For others, it may heighten perceptions of entrepreneurial risk and discourage business creation. These interpretations offer possible explanations for the observed differences across segments rather than mechanisms directly established by the PLS-POS analysis.

However, this study has several limitations. The first is methodological: the use of PLS and composite-based modeling may introduce bias into parameter estimates and affect the treatment of measurement error (Kono & Sato, 2023). The second concerns the sample, which was drawn from a single Saudi university, potentially limiting the generalizability of the findings. Future research should therefore include respondents from universities across different regions of Saudi Arabia to improve the generalizability of the results. A longitudinal design is also recommended to examine changes over time, particularly given the rapid evolution of Saudi Arabia's educational ecosystem.

In conclusion, the current educational programs need to be continuously changed and enhanced to develop competitive future entrepreneurs. With the aid of EP, students should be able to develop their career plans and start their own businesses. To get the best

results, entrepreneurship teaching techniques should be varied. These techniques include role-playing, learning diaries, guest speakers, case studies, simulations, and projects done in partnership with businesses. Effective entrepreneurship does not include favorably evaluating the viability and appeal of starting a new company or venture. Furthermore, Middle Eastern nations with distinctive demographics due to the high proportion of the youthful generation would benefit most from a thorough investigation of this subject in their field of study.

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