

Beyond Entrepreneurship Education: Unpacking the Psychological Pathways to Entrepreneurial Intention

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ABSTRACT

Objective: Entrepreneurship education is widely regarded as an important factor associated with students' entrepreneurial intention; however, the specific cognitive and dispositional dimensions underlying this relationship remain insufficiently understood. This study examines the association between entrepreneurship education and entrepreneurial intention and investigates whether four dimensions of entrepreneurial mindset – alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism – mediate this association. **Method:** A quantitative cross-sectional survey was conducted with 2,696 senior university students at the University of Jambi, Indonesia, selected through purposive sampling. Data were collected using a structured questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), with bootstrapping used to assess the significance of direct and indirect relationships. **Results:** Entrepreneurship education showed a positive and significant association with entrepreneurial intention and with all four dimensions of entrepreneurial mindset. Alertness to opportunity, risk propensity, and ambiguity tolerance were positively associated with entrepreneurial intention and showed significant indirect associations between entrepreneurship education and entrepreneurial intention. Among the four dimensions, alertness to opportunity showed the largest indirect association. In contrast, dispositional optimism was not significantly associated with entrepreneurial intention and did not show a significant indirect association. **Novelty:** This study advances entrepreneurship education research by conceptualizing entrepreneurial mindset as a multidimensional construct rather than a homogeneous psychological construct. By examining its specific dimensions simultaneously, the study provides a more differentiated understanding of how cognitive and dispositional characteristics are associated with the relationship between entrepreneurship education and entrepreneurial intention.

INTRODUCTION

Entrepreneurship is increasingly recognized as a critical driver of innovation, productivity growth, employment creation, and economic development. Beyond generating new economic opportunities, entrepreneurial activity plays a strategic role in addressing complex social and economic challenges, including advancing the Sustainable Development Goals (SDGs) and strengthening community resilience in the face of global disruptions and rapid socioeconomic change (Hill et al., 2024). Consequently, fostering entrepreneurship through new business creation has become an important policy priority in many countries. The creation of new ventures contributes to employment by generating new jobs and replacing those lost or rendered obsolete by economic and technological transformations, while also reflecting economic dynamism and contributing to broader economic development (Barba-Sánchez & Atienza-Sahuquillo, 2018; Hill et al., 2024; Naiborhu & Susanti, 2021). Accordingly, fostering entrepreneurial activity is increasingly important not only for promoting economic development but also

for cultivating a dynamic and resilient economic ecosystem capable of adapting to global disruptions, technological transformations, and emerging challenges.

Entrepreneurial intention is a central construct in entrepreneurship research because it reflects an individual's readiness and willingness to engage in entrepreneurial activities in the future (Ahmed et al., 2020; Anwar et al., 2022; Barba-Sánchez & Atienza-Sahuquillo, 2018; Ben Youssef et al., 2021; Ozaralli & Rivenburgh, 2016). As intention is considered one of the most proximal predictors of planned behavior, including business start-up behavior, understanding the factors that shape entrepreneurial intention is crucial for promoting entrepreneurship among university students (Krueger & Carsrud, 1993; Liñán & Chen, 2009). Among the factors that have received considerable attention, entrepreneurship education has emerged as an important antecedent of entrepreneurial intention (Fietze & Boyd, 2017; Puni et al., 2018; Saeed et al., 2019). Entrepreneurship education enables students to develop entrepreneurial knowledge, skills, and experience, while also providing an understanding of the processes involved in creating and developing new ventures (Uddin et al., 2022). Importantly, its role extends beyond the transmission of business-related knowledge. Entrepreneurship education provides learning experiences and social information that may shape how students perceive opportunities, uncertainty, risk, and the likelihood of success in entrepreneurial activities (Pfeifer et al., 2016; Rodriguez & Lieber, 2020). Empirical evidence generally supports a positive association between entrepreneurship education and entrepreneurial intention. A meta-analysis by Zhang et al. (2022), encompassing 36 studies and 29,736 college students, demonstrated a significant positive relationship between entrepreneurship education and entrepreneurial intention. Similarly, based on data from more than 90,000 students across 100 universities, Sun et al. (2023) found that entrepreneurship education delivered through both curricular and extracurricular activities can strengthen students' intentions to start a business. Collectively, these findings underscore the importance of entrepreneurship education in fostering students' entrepreneurial intentions.

However, the association between entrepreneurship education and entrepreneurial intention may not be adequately explained by educational participation itself. A meta-analysis by Bae et al. (2014), based on 73 studies involving 37,285 participants, found that although the relationship between entrepreneurship education and entrepreneurial intention was significant, its effect size was relatively small. Moreover, after controlling for pre-education entrepreneurial intention, the relationship between entrepreneurship education and post-education entrepreneurial intention was no longer significant. These findings suggest that educational experiences may not translate into entrepreneurial intention uniformly across individuals. Instead, the influence of entrepreneurship education may depend on how students cognitively and psychologically interpret and respond to the learning experiences they encounter. More recent evidence likewise indicates that the relationship between entrepreneurship education and entrepreneurial outcomes can vary according to contextual factors, student characteristics, instructional formats, and prior entrepreneurial experience (Zhang et al., 2022). Thus, an important issue is not only whether entrepreneurship education is associated with entrepreneurial intention, but also through which psychological pathways this association may occur.

From a theoretical perspective, Social Cognitive Theory (SCT) provides a useful framework for explaining how entrepreneurship education may be associated with

entrepreneurial intention through personal-cognitive mechanisms. SCT conceptualizes human functioning as the result of reciprocal interactions among environmental influences, personal factors, and behavior (Bandura, 2001; Schunk & Usher, 2012). Within this framework, entrepreneurship education can be understood as an environmental influence because it provides students with learning experiences, social information, opportunities for observation, feedback, and opportunities to develop entrepreneurial capabilities (Bandura, 2001; Widjojo, 2023). Such experiences may shape not only students' entrepreneurial knowledge and skills but also the ways in which they perceive, interpret, and respond to entrepreneurial situations (Crosina et al., 2024). Through experiential and learning-based activities, entrepreneurship education can further contribute to the development of cognitive frameworks that facilitate opportunity recognition and the interpretation and evaluation of entrepreneurial situations (Costa et al., 2018; Motta & Galina, 2023). In this sense, exposure to entrepreneurship education may foster cognitive orientations that influence how students perceive and evaluate entrepreneurial opportunities and challenges (Cui et al., 2021; Liao et al., 2022). These orientations may, in turn, contribute to entrepreneurial intention by shaping students' perceptions of entrepreneurial opportunities and their willingness to engage in entrepreneurial activity under conditions of risk and uncertainty (Araujo et al., 2023; Hassan et al., 2020). Thus, SCT provides a theoretical basis for understanding entrepreneurship education as an environmental influence that may be associated with entrepreneurial intention through its relationship with students' entrepreneurial mindset.

One psychological mechanism that may help explain this relationship is entrepreneurial mindset (Cui et al., 2021; Kaffka & Krueger, 2018; Mukhtar et al., 2021). Entrepreneurial mindset refers to the ways in which individuals process information, recognize opportunities, navigate uncertainty, assess risks, and form expectations about future possibilities (Cui et al., 2021; Pasic et al., 2025; Sun et al., 2023). However, entrepreneurial mindset is not necessarily a homogeneous psychological construct. Its conceptualization and measurement remain fragmented, with research drawing on diverse theoretical perspectives and emphasizing different cognitive and dispositional characteristics (Daspit et al., 2023). In the present study, entrepreneurial mindset is conceptualized as comprising four complementary dimensions: alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism (Cui et al., 2021). These dimensions capture distinct ways in which students may perceive, interpret, and respond to entrepreneurial situations, thereby providing a multidimensional perspective on how environmental learning experiences may become reflected in entrepreneurial intention.

The four dimensions are particularly relevant because they capture distinct psychological processes involved in entrepreneurial decision-making. Alertness to opportunity reflects an individual's ability to recognize and evaluate potential opportunities and has been associated with entrepreneurial intention (Alshahrani et al., 2026; Soni & Bakhru, 2023). Risk propensity reflects an individual's willingness to accept uncertainty and potential losses as part of entrepreneurial decision-making and has been positively associated with entrepreneurial intention (Ilevbare et al., 2022; Ozaralli & Rivenburgh, 2016). Ambiguity tolerance concerns how individuals interpret, process, and respond to unclear situations characterized by inconsistent, complex, unfamiliar, or

fragmented information (Furnham & Ribchester, 1995) and has also been associated with students' entrepreneurial intention (Nasip et al., 2017). Dispositional optimism, meanwhile, reflects an individual's tendency to maintain positive expectations about future outcomes, including when facing uncertainty and challenges in the entrepreneurial process (Crane et al., 2012; Luan & Zhang, 2025).

Although these dimensions are conceptually related, they do not necessarily represent the same psychological mechanism. Alertness to opportunity primarily concerns the recognition and evaluation of entrepreneurial possibilities, whereas risk propensity concerns willingness to accept potential losses and uncertainty. Ambiguity tolerance relates to the capacity to function when information is unclear or incomplete, while dispositional optimism reflects generalized expectations regarding future outcomes (Daspit et al., 2023; Shepherd et al., 2010). Consequently, entrepreneurship education may be associated with these dimensions in different ways because educational experiences may provide different types of information, challenges, social interactions, and opportunities for cognitive development (Cui et al., 2021; Motta & Galina, 2023). Similarly, each dimension may have a different relationship with entrepreneurial intention. Treating entrepreneurial mindset as a single homogeneous construct could therefore conceal important differences in the psychological pathways connecting entrepreneurship education with entrepreneurial intention (Daspit et al., 2023; Sun et al., 2023).

The four dimensions should not, however, be interpreted as exhausting the broader conceptual domain of entrepreneurial mindset. Other characteristics, including entrepreneurial self-efficacy, resilience, creativity, and related personal dispositions, have also been associated with entrepreneurial cognition and behavior (Karami et al., 2025; Korber & McNaughton, 2018; Newman et al., 2019). The present study deliberately focuses on alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism because these dimensions capture complementary ways in which individuals recognize opportunities, respond to uncertainty and risk, and form expectations about future entrepreneurial outcomes, consistent with the multidimensional conceptualization proposed by Cui et al. (2021). This delimitation defines the conceptual scope of the study and enables the examination of a theoretically coherent set of cognitive and dispositional mechanisms without implying that these four dimensions exhaust the broader construct of entrepreneurial mindset.

These theoretical considerations are particularly relevant in the Indonesian higher education context, where strengthening student entrepreneurship has become an important policy and institutional concern. Despite Indonesia's economic progress, unemployment and the need to strengthen entrepreneurial activity remain important socioeconomic challenges. In August 2025, Indonesia recorded an open unemployment rate of 4.85%, equivalent to approximately 7.46 million unemployed people, indicating that labor-market absorption remains an important concern (Badan Pusat Statistik, 2025). From the perspective of entrepreneurial activity, Indonesia also continues to face challenges in strengthening its entrepreneurial ecosystem. The Global Entrepreneurship Monitor reported that Indonesia's Total Early-Stage Entrepreneurial Activity (TEA) ranked 36th among 49 countries, indicating the continuing need to strengthen early-stage entrepreneurial activity (Hill et al., 2023). In response to these challenges, the Indonesian

government has established policies to promote entrepreneurship development, including Presidential Regulation No. 2 of 2022 on the National Entrepreneurship Development for 2021–2024, which targeted a national entrepreneurship ratio of 3.95% by 2024. However, the ratio was reported at approximately 3.35% in February 2025 (Kementerian Perindustrian Republik Indonesia, 2025), below the established target. These conditions have reinforced the importance of strengthening entrepreneurship through various policy and institutional initiatives, including higher education. At the higher education level, the government has supported student entrepreneurship through programs such as the Program Pembinaan Mahasiswa Wirausaha (P2MW), which provides business development, funding, training, and mentoring for student entrepreneurs (Direktorat Pembelajaran dan Kemahasiswaan, 2025). These developments provide a relevant national context for examining not only whether entrepreneurship education is associated with entrepreneurial intention, but also the psychological processes through which educational experiences may shape students' entrepreneurial orientations.

Universitas Jambi (UNJA) provides a particularly relevant context for examining these processes because entrepreneurship is institutionally embedded in the university's educational vision, mission, and curriculum. UNJA's vision is to become a "World Class Entrepreneurship University," reflecting an institutional commitment to developing entrepreneurship across its academic activities. This commitment is further reflected in the university's mission, which emphasizes the development of students' entrepreneurial creativity according to their talents and interests, the production of competitive graduates who are entrepreneurs across different fields of knowledge, and the development of creative and innovative research that supports quality entrepreneurship education (Universitas Jambi, 2022). Consistent with this institutional orientation, the UNJA Academic Regulations require entrepreneurship education to be incorporated into the university curriculum at several levels. The curriculum includes a compulsory university-level Entrepreneurship course worth 3 credits, in addition to a compulsory entrepreneurship course or its equivalent at the faculty level worth 3 credits and another compulsory entrepreneurship course or its equivalent at the study-program level worth 3 credits (Universitas Jambi, 2024). Thus, entrepreneurship education at UNJA is structurally integrated into students' formal curricular learning experiences rather than being confined to extracurricular activities. This institutional context provides a particularly relevant setting for examining whether entrepreneurship education contributes to students' entrepreneurial intention and, more importantly, how it may shape the cognitive and dispositional dimensions of entrepreneurial mindset that mediate this relationship.

Despite growing evidence concerning entrepreneurship education, entrepreneurial mindset, and entrepreneurial intention, an important research gap remains. Existing studies have examined the relationship between entrepreneurship education and entrepreneurial intention, while some have considered entrepreneurial mindset as a mediating mechanism. For example, Sun et al. (2023) provide evidence for the mediating role of entrepreneurial mindset in the relationship between entrepreneurship education and entrepreneurial intention. However, treating entrepreneurial mindset as an overarching construct provides limited insight into whether different cognitive and

dispositional characteristics constitute distinct pathways linking entrepreneurship education with entrepreneurial intention. Although Cui et al. (2021) conceptualized entrepreneurial mindset as comprising alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism, and Ramadani et al. (2024) provided further empirical application of these dimensions, limited research has examined whether these dimensions operate as distinct mediating mechanisms in the relationship between entrepreneurship education and entrepreneurial intention.

Accordingly, this study aims to examine the relationship between entrepreneurship education and students' entrepreneurial intention and to clarify the psychological mechanisms through which this relationship may occur. Specifically, the study investigates whether entrepreneurship education is associated with entrepreneurial intention and whether four dimensions of entrepreneurial mindset—alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism—mediate this relationship. By examining these dimensions as distinct mediating mechanisms, the study seeks to clarify the respective roles of opportunity-related, decision-oriented, and dispositional characteristics in explaining how an environmental educational factor may be associated with students' entrepreneurial intention.

By addressing this gap, the study contributes theoretically by integrating Social Cognitive Theory with a multidimensional conceptualization of entrepreneurial mindset to clarify how an environmental educational factor may be associated with entrepreneurial intention through differentiated cognitive and dispositional mechanisms. Empirically, the study extends existing research by examining the four dimensions of entrepreneurial mindset separately rather than treating entrepreneurial mindset as a homogeneous construct, thereby providing insight into whether distinct psychological characteristics are involved in this relationship. Practically, the findings may assist higher education institutions in designing entrepreneurship education that extends beyond knowledge and skill acquisition to address specific psychological orientations relevant to entrepreneurial decision-making and intention.

Literature Review and Hypothesis Development

Social Cognitive Theory

Social Cognitive Theory (SCT) is a psychological perspective on human functioning that emphasizes the critical role of the social environment in shaping motivation, learning, and self-regulation (Schunk & Usher, 2012). SCT posits that human functioning is shaped by reciprocal interactions among individuals, their behavior, and their environment (Bandura, 2001). A central principle of SCT is the concept of reciprocal determinism, whereby human behavior operates within a triadic framework involving three interrelated sources of influence: personal factors, such as cognitions, beliefs, skills, and emotions; behavioral factors; and social or environmental factors (Schunk & Usher, 2012).

In this study, SCT provides a theoretical foundation for understanding the entrepreneurial mindset as a personal-cognitive mechanism linking entrepreneurship education to entrepreneurial intention. This perspective is grounded in Bandura's view that cognitive processes play a central role in regulating human action. Individuals actively engage in cognitive processes to evaluate their capabilities, anticipate potential outcomes, interpret environmental conditions, and regulate their behavior (Bandura,

2001). Thus, environmental experiences are not necessarily directly associated with behavioral intentions; rather, these associations may be mediated by psychological and cognitive factors.

In the context of this study, entrepreneurship education is conceptualized as an environmental factor, the entrepreneurial mindset as a personal-cognitive factor, and entrepreneurial intention as an individual's motivational orientation toward future entrepreneurial action. This conceptualization is consistent with SCT, which explains human functioning through reciprocal interactions among environmental influences, personal-cognitive factors, and behavior (Nwosu et al., 2022; Tong et al., 2025). Within the entrepreneurship context, educational and learning experiences constitute environmental factors that may be associated with individuals' cognitive orientations and, in turn, with entrepreneurial outcomes (Nwosu et al., 2022).

Empirical evidence further supports the relevance of this perspective to entrepreneurship education and entrepreneurial intention. Wibowo et al. (2023), for example, found that entrepreneurship education positively influences digital entrepreneurial intention and that entrepreneurial intuition mediates this relationship. These findings suggest that entrepreneurship education can influence entrepreneurial intentions through psychological and cognitive mechanisms, indicating that the relationship between educational experiences and entrepreneurial intentions should not necessarily be understood solely as a direct relationship (Wibowo et al., 2023).

Building on these principles, SCT provides a theoretical foundation for explaining the relationships among the variables examined in this study. Entrepreneurship education represents part of the social environment and learning experiences through which students acquire knowledge, engage in interactions, observe entrepreneurial activities, and gain relevant experiences. These experiences are subsequently processed through personal-cognitive mechanisms, represented in this study by the entrepreneurial mindset. Specifically, the entrepreneurial mindset comprises alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism. These personal cognitive characteristics may, in turn, contribute to the formation of entrepreneurial intention.

Entrepreneurship Education and Entrepreneurial Intention

Entrepreneurship education represents an environmental factor that provides students with experiences, knowledge, and learning opportunities relevant to entrepreneurial activities. From the perspective of Social Cognitive Theory, the learning environment influences individual development through cognitive processes and learning experiences that subsequently shape behavior and goals (Bandura, 2001; Xiang et al., 2023). In the context of higher education, entrepreneurship education exposes students to business creation processes, opportunity recognition, decision-making, and other experiential learning activities that can enhance their understanding of entrepreneurship as a potential career choice (Nabi et al., 2017; Xiang et al., 2023).

Empirically, the role of entrepreneurship education in fostering entrepreneurial intention has received considerable scholarly attention (Arief, 2021; Fietze & Boyd, 2017; Puni et al., 2018; Saeed et al., 2019). Entrepreneurship education is designed to equip students with the knowledge, attitudes, and skills necessary for entrepreneurial activity,

thereby potentially addressing educated unemployment by fostering entrepreneurial attitudes and intention (Uddin et al., 2022). More importantly, existing research identifies entrepreneurship education as an important antecedent of entrepreneurial intention (Maresch et al., 2016). Based on this argument, the following hypothesis is proposed:

H1: Entrepreneurship education is positively associated with entrepreneurial intention.

Entrepreneurship Education, Alertness to opportunity, Entrepreneurial Intention

Entrepreneurship education not only provides knowledge about the concepts and processes involved in starting a business but can also shape the mindset and psychological characteristics that support entrepreneurial behavior (Pfeifer et al., 2016; Rodriguez & Lieber, 2020). An entrepreneurial mindset reflects how individuals think, interpret, and respond to conditions inherent in the entrepreneurial process. In this study, the entrepreneurial mindset is conceptualized through four dimensions: alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism. These dimensions capture complementary cognitive and psychological tendencies that enable individuals to recognize opportunities, navigate risk and uncertainty, and maintain positive expectations about future outcomes (Cui et al., 2021). From this perspective, individuals engaging in entrepreneurial activity require the ability to recognize opportunities, demonstrate a willingness to accept risk, function effectively under ambiguous conditions, and maintain positive expectations about the future (Cui et al., 2021). Accordingly, entrepreneurship education can be viewed as a learning environment that has the potential to develop multiple dimensions of students' entrepreneurial mindset.

One important dimension of the entrepreneurial mindset is alertness to opportunity, which refers to an individual's tendency to attend to environmental information, recognize changes, and identify potential entrepreneurial opportunities (Alshahrani et al., 2026; Soni & Bakhru, 2023). This capability is important because entrepreneurship involves not only creating a business but also identifying and evaluating opportunities that can be exploited. Research on alertness to opportunity suggests that the ability to identify entrepreneurial opportunities constitutes an important mechanism in the entrepreneurial process and is associated with entrepreneurial intention (Araujo et al., 2023). Empirical evidence further indicates that entrepreneurship education can contribute to the development of entrepreneurial mindset characteristics, including capabilities related to alertness to opportunity (Cui et al., 2021; Sun et al., 2023). Moreover, individuals who are better able to identify potential opportunities arising from market changes, consumer needs, or unresolved problems may be more likely to consider entrepreneurship as a viable career option. Consistent with this argument, empirical studies indicate that alertness to opportunity is an important predictor of students' entrepreneurial intention (Alshahrani et al., 2026; Soni & Bakhru, 2023). While meta-analytic evidence demonstrates a positive association between alertness to opportunity and entrepreneurial outcomes, including opportunity recognition and entrepreneurial intention (Araujo et al., 2023).

Entrepreneurship education is therefore expected to be positively associated with students' perceived ability to identify and evaluate entrepreneurial opportunities, while

individuals with greater alertness to opportunity are more likely to report stronger entrepreneurial intention (Otache et al., 2024). Previous research has demonstrated that entrepreneurship education can foster entrepreneurial mindset characteristics and that entrepreneurial alertness is positively associated with entrepreneurial intention (Araujo et al., 2023; Cui et al., 2021). Furthermore, evidence concerning entrepreneurship education and alertness to opportunity suggests that this dimension may constitute an important psychological pathway through which educational experiences are associated with entrepreneurial intention (Cui, 2021a; Otache et al., 2024). Accordingly, based on the theoretical arguments and empirical evidence presented above, the following hypotheses are proposed:

H2a: Entrepreneurship education is positively associated with alertness to opportunity.

H3a: Alertness to opportunity is positively associated with entrepreneurial intention.

H4a: Alertness to opportunity mediates the association between entrepreneurship education and entrepreneurial intention.

Entrepreneurship Education, Risk Propensity, and Entrepreneurial Intention

An entrepreneurial mindset also encompasses risk propensity, which refers to an individual's willingness to take action despite uncertainty regarding potential outcomes (Ilevbare et al., 2022; Ozaralli & Rivenburgh, 2016). This characteristic is particularly relevant to entrepreneurial activity because aspiring entrepreneurs often need to make decisions concerning opportunities, resource allocation, and courses of action when information about future outcomes is incomplete (Cui & Bell, 2022; Zhao et al., 2005). Empirical evidence suggests that experiential entrepreneurship education is associated with greater tolerance for risk among students (Bandera et al., 2018). Consistent with this evidence, risk propensity has been identified as one of the dimensions of the entrepreneurial mindset that can be shaped by entrepreneurship education experiences (Cui et al., 2021). Furthermore, individuals with higher risk propensity may be more willing to pursue entrepreneurial activities despite the possibility of failure or financial loss (Talukder et al., 2024). Empirical studies have also demonstrated a positive association between risk propensity and entrepreneurial intention (Ilevbare et al., 2022; Ozaralli & Rivenburgh, 2016; Talukder et al., 2024). Entrepreneurship education may enhance students' attitudes toward and tolerance for risk through experiential learning, while risk propensity may subsequently contribute to entrepreneurial intention by influencing how individuals evaluate and respond to uncertain entrepreneurial situations (Ndofirepi, 2020; Zhao et al., 2005). Furthermore, studies examining the relationships among entrepreneurship education, risk propensity, and entrepreneurial intentions provide an empirical basis for considering risk propensity as a potential mediating mechanism through which educational experiences contribute to entrepreneurial intention (Bandera et al., 2018). Based on these theoretical arguments and empirical findings, the following hypotheses are proposed:

H2b: Entrepreneurship education is positively associated with risk propensity.

H3b: Risk propensity is positively associated with entrepreneurial intention.

H4b: Risk propensity mediates the association between entrepreneurship education and entrepreneurial intention.

Entrepreneurship Education, Ambiguity Tolerance, and Entrepreneurial Intention

Another important dimension of the entrepreneurial mindset is ambiguity tolerance, which refers to an individual's ability to remain functional and make decisions when confronted with unclear and complex situations characterized by incomplete information (Furnham & Ribchester, 1995). Entrepreneurship education, particularly when it incorporates experiential and action-based learning approaches, exposes students to problems that do not necessarily have a single correct solution (De Sandt & Mauer, 2019). Such experiences can encourage students to make decisions, experiment with alternative approaches, evaluate outcomes, and adapt their actions when confronted with uncertainty (Hedeboe Frederiksen, 2025). Accordingly, entrepreneurship education can provide a learning environment that helps students develop the capacity to cope with ambiguity. Previous research has shown that action-based entrepreneurship education can enhance students' ambiguity tolerance while also strengthening their ability to evaluate entrepreneurial opportunities (De Sandt & Mauer, 2019).

Ambiguity tolerance is particularly relevant to entrepreneurship because decisions to launch a new venture often need to be made before complete information about markets, consumers, competitors, and the likelihood of success is available (McKelvie et al., 2011). Individuals with greater ambiguity tolerance may therefore be better equipped to function under such conditions and less likely to perceive uncertainty as a reason to avoid entrepreneurial activity (Nasip et al., 2017). Accordingly, individuals who are more capable of accepting ambiguous and uncertain situations may be more likely to view entrepreneurship as a viable course of action and career option. In this sense, ambiguity tolerance may constitute an important personal-cognitive mechanism linking educational experiences to entrepreneurial intention. Entrepreneurship education that provides direct exposure to unstructured problems and uncertain conditions can help students develop the ability to cope with ambiguity (Hedeboe Frederiksen, 2025). This ability, in turn, may strengthen students' readiness to consider entrepreneurship as a potential course of action (Cui & Gu, 2024; De Sandt & Mauer, 2019). Taken together, these relationships provide a theoretical and empirical basis for examining whether ambiguity tolerance mediates the association between entrepreneurship education and entrepreneurial intention. Based on these theoretical arguments and empirical findings, the following hypotheses are proposed:

H2c: Entrepreneurship education is positively associated with ambiguity tolerance.

H3c: Ambiguity tolerance is positively associated with entrepreneurial intention.

H4c: Ambiguity tolerance mediates the association between entrepreneurship education and entrepreneurial intention.

Entrepreneurship Education, Dispositional Optimism, and Entrepreneurial Intention

An entrepreneurial mindset is also associated with dispositional optimism, which reflects an individual's tendency to maintain positive expectations about the future and to believe that future events are likely to result in favorable outcomes (Crane et al., 2012). In the

context of entrepreneurship, optimism may help individuals maintain a positive outlook when facing uncertainty, obstacles, and the possibility of failure during the venture creation process (Luan & Zhang, 2025; Ozaralli & Rivenburgh, 2016). Entrepreneurship education that incorporates hands-on experiences, opportunities for problem-solving, feedback, and observation of activity outcomes may help students develop more positive expectations regarding their ability to address entrepreneurial challenges (Cui, 2021b). Research on entrepreneurship education and psychological capital also indicates a relationship between entrepreneurial learning experiences and the development of positive psychological states, including optimism. Furthermore, optimism-oriented approaches to entrepreneurship education suggest that instructional practices designed to foster positive psychological orientations can enhance students' dispositional optimism (Crane & Meyer, 2007; Cui, 2021b).

Dispositional optimism is particularly relevant to entrepreneurship because the venture creation process often involves obstacles, uncertainty, resource constraints, and the possibility of failure (Mergemeier et al., 2018). Optimistic individuals tend to expect that their efforts and actions will produce favorable outcomes, which may make them more willing to pursue entrepreneurial opportunities despite potential challenges (Luan & Zhang, 2025; Ozaralli & Rivenburgh, 2016). Empirical evidence further indicates that dispositional optimism is associated with entrepreneurial intention (Madar et al., 2019; Ozaralli & Rivenburgh, 2016). Entrepreneurship education can provide learning experiences that shape students' perceptions of their likelihood of success and their ability to cope with entrepreneurial challenges. Such experiences may contribute to the development of dispositional optimism, which, in turn, may influence students' willingness to pursue entrepreneurial goals (Chevalier et al., 2022; Madar et al., 2019). Based on these theoretical arguments and empirical findings, the following hypotheses are proposed:

H2d: Entrepreneurship education is positively associated with dispositional optimism.

H3d: Dispositional optimism is positively associated with entrepreneurial intention.

H4d: Dispositional optimism mediates the association between entrepreneurship education and entrepreneurial intention.

Figure 1 presents the proposed research framework, illustrating the hypothesized relationships among entrepreneurship education, entrepreneurial mindset, and entrepreneurial intention. The framework depicts both the direct and indirect relationships among the variables examined in this study.

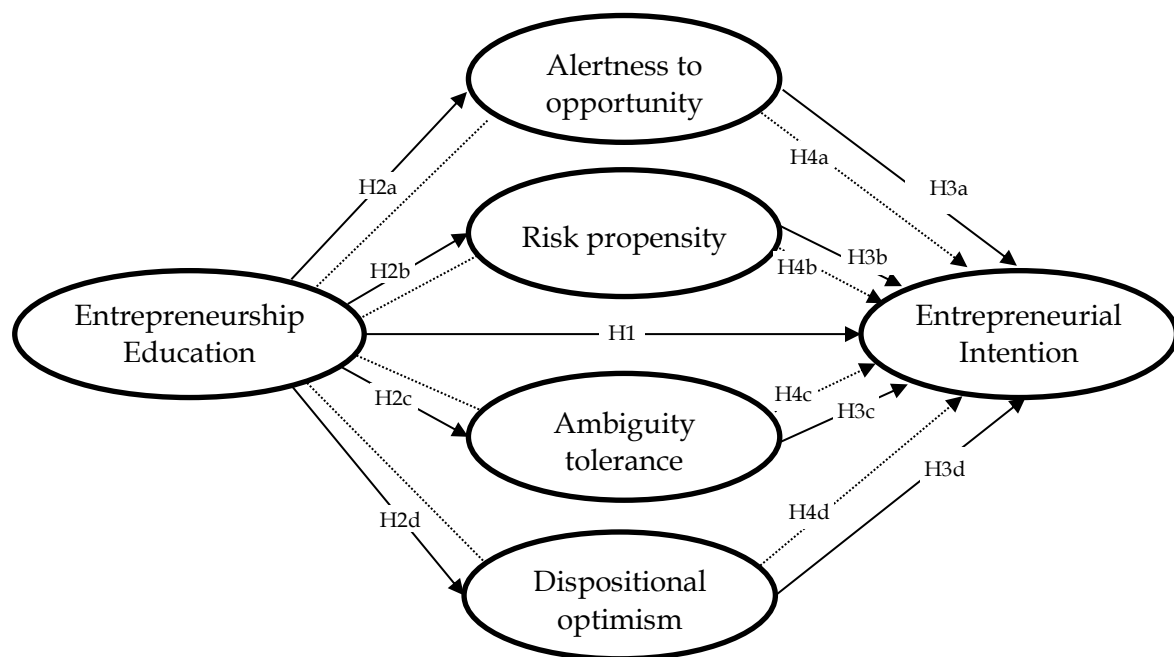


Figure 1. Conceptual Research Model.

RESEARCH METHOD

Research Design

This study employed a quantitative explanatory research design to examine the associations among entrepreneurship education, entrepreneurial mindset, and entrepreneurial intention. Specifically, the study examined the direct association between entrepreneurship education and entrepreneurial intention, as well as the indirect associations between these constructs through four dimensions of entrepreneurial mindset: alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism. A cross-sectional survey design was adopted, with data collected from university students at a single point in time. This design was considered appropriate because the study aimed to examine the relationships among the constructs based on students' perceptions and experiences of entrepreneurship education. The proposed structural model comprised one exogenous construct, four mediating constructs, and one endogenous construct. The hypothesized relationships were estimated using Partial Least Squares Structural Equation Modeling (PLS-SEM). Given the cross-sectional design, the estimated relationships are interpreted as statistical associations and predictive relationships rather than evidence of temporal or causal effects.

Population and Sample

The study population consisted of active undergraduate students in their sixth semester or above at the University of Jambi, Indonesia. These students were selected because they had acquired relatively extensive academic experience and were at a stage of their studies when they were increasingly likely to consider their career options after graduation. Eligible respondents were active undergraduate students enrolled in the sixth semester or above who voluntarily agreed to participate in the study. Purposive sampling was

employed based on these eligibility criteria. The minimum required sample size was determined through an a priori power analysis using G*Power version 3.1.9.7. Assuming a statistical power of 80%, the analysis indicated that a minimum of 395 respondents was required to achieve adequate statistical power for the planned Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis. Following data screening and application of the eligibility criteria, 2696 valid responses were retained for the final analysis. The demographic characteristics of the final sample are presented in Table 1.

Table 1. Demographic Characteristics of the Respondents.

Characteristics	n (2696)	Percentage
Gender		
Male	1041	39%
Female	1655	61%
Semester of Study		
6th semester	94	3%
8th semester	1965	73%
More than 8 semesters	637	24%
Faculty		
Economics and Business	460	17%
Law	344	13%
Medicine and Health Sciences	219	8%
Education and Teacher Training	787	29%
Agriculture	357	13%
Animal Science	145	5%
Science and Technology	384	14%
Entrepreneurial Experience		
No prior entrepreneurial experience	1614	60%
Prior entrepreneurial experience	1082	40%

Data Collection Method

This study used primary data collected through a structured questionnaire administered to active undergraduate students in their sixth semester or above. Data were collected online using Google Forms from February to May 2026. Before completing the questionnaire, respondents were provided with information about the research objectives, data confidentiality, the voluntary nature of their participation, and the use of the collected data solely for research purposes. Respondents were also informed that there were no right or wrong answers and were encouraged to provide responses based on their own experiences, circumstances, and perceptions. The questionnaire consisted of two main sections. The first section collected information on respondents' demographic characteristics, while the second section comprised statements designed to measure the research constructs: entrepreneurship education, alertness to opportunity, risk propensity, ambiguity tolerance, dispositional optimism, and entrepreneurial intention. Prior to the main data collection, the instrument was pilot-tested to assess the clarity and comprehensibility of the items and to evaluate their preliminary measurement properties. The findings from the pilot study were used to refine the instrument before its administration in the main study.

Measurement Instruments

The questionnaire consisted of closed-ended statements that respondents were asked to answer based on their perceptions and experiences. All measurement items were adapted from instruments used in reputable international studies, with adjustments made to the language and research context without altering the conceptual meaning of the respective indicators. The adaptation process involved translating each instrument item from English into Indonesian while preserving the conceptual meaning of the original items. Following the translation, the Indonesian version was reviewed by a linguist with expertise in bilingual academic translation (English-Indonesian). This review was conducted to ensure that the meaning of each item remained consistent with that of the original instrument, thereby maintaining semantic and conceptual equivalence (Beaton et al., 2000). Feedback from the linguist was subsequently used to refine the wording of the items to ensure that they were readily understandable to respondents without compromising the substantive meaning of the constructs being measured. All constructs were measured using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

The entrepreneurship education construct was measured using an instrument assessing students' perceptions of the entrepreneurship learning experiences they received during their coursework. This study adapted the scale used by Mukhtar et al. (2021), which was grounded in a conceptual framework derived from the concept of educational support introduced by Denanyoh et al. (2015). The scale has demonstrated satisfactory psychometric properties, with factor loadings above 0.70 for all items and a Cronbach's alpha (α) value above 0.80.

The entrepreneurial mindset was measured using a scale adapted from Cui et al. (2021), which has demonstrated satisfactory validity and reliability. The scale comprises four dimensions: alertness to opportunity (6 items), risk propensity (5 items), ambiguity tolerance (5 items), and dispositional optimism (6 items). All items exhibited factor loadings above 0.70, while Cronbach's alpha values exceeded 0.80 across all dimensions. Several items across the entrepreneurial mindset dimensions were negatively worded in their original form. These items were reverse-coded prior to analysis so that higher scores consistently represented higher levels of the respective entrepreneurial mindset dimensions.

Entrepreneurial intention was measured in terms of students' desire, commitment, and plans to start a business in the future. The measurement scale was adapted from the Entrepreneurial Intention Questionnaire (EIQ) developed by Liñán & Chen (2009), which has been widely used and psychometrically validated in previous entrepreneurship research.

Data Analysis

The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0 software. PLS-SEM was selected because the study focuses on examining predictive relationships among entrepreneurship education, the four dimensions of entrepreneurial mindset, and entrepreneurial intention, while also assessing statistically significant indirect relationships (Hair et al., 2022). The analysis comprised two main stages: evaluation of the measurement model and evaluation of the structural model.

For the measurement model, indicator reliability was assessed based on outer loading values, while the internal consistency reliability of the constructs was evaluated using Cronbach's alpha and composite reliability. Convergent validity was assessed using the Average Variance Extracted (AVE), whereas discriminant validity was examined using the Heterotrait-Monotrait (HTMT) ratio (Hair et al., 2022; Henseler et al., 2015). Prior to assessing the measurement model, all negatively worded items across the entrepreneurial mindset dimensions were reverse-coded to ensure consistent indicator orientation. After reverse coding, higher scores consistently represented higher levels of the corresponding entrepreneurial mindset dimensions. Prior to evaluating the structural model, potential multicollinearity among the predictor constructs was assessed using the variance inflation factor (VIF). The explanatory power of the model was then evaluated using the coefficient of determination (R^2), while the effect size (f^2) was used to assess the relative contribution of each predictor construct to the endogenous constructs.

The model's predictive performance was further assessed using PLSpredict by comparing the prediction errors generated by the PLS-SEM model with those of a linear regression model (LM), thereby evaluating the model's out-of-sample predictive ability (Shmueli et al., 2019). Hypothesis testing was performed using a bootstrapping procedure with 5,000 subsamples to obtain path coefficients, standard errors, t-statistics, and p-values. Statistical significance was assessed using 95% bootstrap confidence intervals, with an effect considered statistically significant when the confidence interval did not include zero (Hair et al., 2022).

Mediation effects were assessed using specific indirect effects to determine whether each dimension of the entrepreneurial mindset—alertness to opportunity, risk propensity, ambiguity tolerance, and dispositional optimism—mediated the association between entrepreneurship education and entrepreneurial intention. This analytical approach enabled the study to assess not only the direct association between entrepreneurship education and entrepreneurial intention but also the specific indirect associations involving the personal-cognitive dimensions of entrepreneurial mindset.

RESULTS AND DISCUSSION

Results

Measurement Model Evaluation

A measurement model assessment was conducted to ensure that all constructs met the established reliability and validity criteria before evaluating the structural model. Based on the assessment results, several indicators that did not meet the predefined measurement criteria were removed, while the remaining indicators were retained for subsequent analysis. As presented in Table 2, all retained indicators exhibited outer loadings above 0.70, while the Average Variance Extracted (AVE) for each construct exceeded 0.50. In addition, Cronbach's alpha and composite reliability values for all constructs were above the recommended threshold of 0.70, indicating satisfactory internal consistency reliability.

Table 2. Measurement Model Assessment.

Construct	Code	Item	Outer Loadings	CA	CR	AVE
Entrepreneurial Intention	EI1	I am ready to do anything to become an entrepreneur.	0.816	0.936	0.949	0.758
	EI2	My career goal is to become an entrepreneur.	0.841			
	EI3	I will make every effort to start and run my own business.	0.893			
	EI4	I am determined to establish a business in the future.	0.893			
	EI5	I have seriously thought about starting my own business.	0.883			
	EI6	I have a strong intention to start a business someday.	0.893			
Entrepreneurship Education	EE1	Entrepreneurship education at university helps students think creatively to support a career as an entrepreneur.	0.900	0.949	0.961	0.831
	EE2	The university helps develop the skills students need to become entrepreneurs.	0.920			
	EE3	The university enhances students' entrepreneurship-related skills.	0.930			
	EE4	The university provides useful information and guidance on how to start a business.	0.912			
	EE5	I believe that entrepreneurial abilities can be developed through education.	0.896			
Alertness to opportunity	AO1	I frequently interact with others to obtain new information.	0.897	0.927	0.948	0.820
	AO2	I enjoy seeking new information.	0.906			
	AO3	I can see connections between information that initially appears unrelated.	0.914			
	AO4	I can distinguish between profitable and unprofitable opportunities.	0.906			
Risk propensity	RP1	I like trying new opportunities even when there is a possibility of failure.	0.910	0.896	0.935	0.827
	RP2	To achieve greater returns, I am willing to take higher risks.	0.906			
	RP3	I enjoy trying new experiences even when they involve risks.	0.912			
Ambiguity tolerance	AT1	If I am uncertain about the responsibilities involved in a task, I become very anxious.	0.896	0.920	0.943	0.806
	AT2	I feel uncomfortable when I cannot understand other people's thought processes.	0.910			
	AT3	Before undertaking an important task, I need to know how long it will take.	0.903			

Construct	Code	Item	Outer Loadings	CA	CR	AVE
Dispositional optimism	AT4	A good task is one in which it is clear what needs to be done and how to do it.	0.882			
	DO1	Even in uncertain situations, I still expect the best possible outcome.	0.907	0.902	0.939	0.836
	DO2	I am always optimistic about my future.	0.924			
	DO3	In general, I expect more good things to happen to me than bad things.	0.913			

Discriminant validity was further assessed using the Heterotrait-Monotrait (HTMT) ratio and indicator cross-loadings. As shown in Table 3, most pairs of constructs met the recommended HTMT criteria. However, the HTMT value of 0.921 between dispositional optimism and ambiguity tolerance indicates a relatively high empirical association between the two constructs. Although this value slightly exceeds the commonly used threshold of 0.90, HTMT values should not be interpreted mechanically based solely on predetermined cut-off values but should also be considered in relation to the conceptual distinctiveness of the constructs (Franke & Sarstedt, 2019). Similarly, the HTMT value between risk propensity and alertness to opportunity was 0.883. Although this value is relatively high, it remains below the 0.90 threshold and therefore does not raise a critical concern regarding discriminant validity. In both cases, the conceptual distinctiveness of the constructs was considered alongside the HTMT values, and the results did not warrant changes to the structural model specification.

Table 3. Discriminant validity Using HTMT.

Construct Pair	Heterotrait-monotrait ratio (HTMT)
Ambiguity tolerance <-> Alertness to opportunity	0.883
Dispositional optimism <-> Alertness to opportunity	0.848
Dispositional optimism <-> Ambiguity tolerance	0.921
Entrepreneurial Intention <-> Alertness to opportunity	0.791
Entrepreneurial Intention <-> Ambiguity tolerance	0.755
Entrepreneurial Intention <-> Dispositional optimism	0.734
Entrepreneurship Education <-> Alertness to opportunity	0.782
Entrepreneurship Education <-> Ambiguity tolerance	0.744
Entrepreneurship Education <-> Dispositional optimism	0.730
Entrepreneurship Education <-> Entrepreneurial Intention	0.814
Risk propensity <-> Alertness to opportunity	0.883
Risk propensity <-> Ambiguity tolerance	0.859
Risk propensity <-> Dispositional optimism	0.844
Risk propensity <-> Entrepreneurial Intention	0.791
Risk propensity <-> Entrepreneurship Education	0.822

To provide additional empirical evidence, indicator cross-loadings were examined, particularly for ambiguity tolerance and dispositional optimism.

Table 4. Cross-Loadings for Assessing Discriminant Validity.

Indicators	Ambiguity tolerance	Dispositional optimism
AT1	0.896	0.749
AT2	0.910	0.756
AT4	0.903	0.770
AT5	0.882	0.739
DO1	0.774	0.907
DO2	0.778	0.924
DO3	0.750	0.913

AT= Ambiguity tolerance, DO= Dispositional optimism

The cross-loading results presented in Table 4 showed that all indicators loaded more strongly on their respective constructs than on the alternative construct. The AT indicators loaded 0.882–0.910 on ambiguity tolerance, compared with 0.739–0.770 on dispositional optimism, while the DO indicators loaded 0.907–0.924 on dispositional optimism, compared with 0.750–0.778 on ambiguity tolerance. Thus, each indicator showed its highest loading on its theoretically assigned construct.

In this study, dispositional optimism and ambiguity tolerance were retained because they capture conceptually distinct aspects of the entrepreneurial mindset. Dispositional optimism reflects positive expectations regarding future outcomes, whereas ambiguity tolerance reflects an individual's ability to function and make decisions under uncertain and unclear conditions. Although the HTMT value of 0.921 indicates substantial empirical overlap between the two constructs, the cross-loading results showed that all indicators loaded more strongly on their respective constructs than on the alternative construct (Gefen, 2005; Henseler et al., 2015). Thus, the findings provide additional empirical support for treating dispositional optimism and ambiguity tolerance as separate, although closely related, dimensions.

Overall, the measurement model demonstrated satisfactory indicator reliability, internal consistency reliability, and convergent validity. The discriminant validity assessment showed that the constructs were empirically distinguishable, although dispositional optimism and ambiguity tolerance exhibited substantial empirical overlap. The retained indicators and constructs were therefore considered adequate for subsequent structural model assessment.

Structural Model Evaluation

Collinearity Assessment

Multicollinearity was assessed to ensure that excessive correlations among the predictor constructs in the structural model did not distort the estimation of path coefficients. Multicollinearity was evaluated using the Variance Inflation Factor (VIF), with values below 5 indicating the absence of serious multicollinearity concerns. As shown in Table 5, the VIF values ranged from 1.000 to 4.602, all of which were below the recommended threshold of 5. These results indicate that the structural model does not exhibit problematic multicollinearity, suggesting that the predictor constructs can be retained for subsequent structural model assessment and hypothesis testing.

Table 5. Collinearity Assessment of the Structural Model.

Direct effect	VIF
Alertness to opportunity -> Entrepreneurial Intention	4.124
Ambiguity tolerance -> Entrepreneurial Intention	4.602
Dispositional optimism -> Entrepreneurial Intention	3.863
Entrepreneurship Education -> Alertness to opportunity	1.000
Entrepreneurship Education -> Ambiguity tolerance	2.164
Entrepreneurship Education -> Dispositional optimism	1.000
Entrepreneurship Education -> Entrepreneurial Intention	2.667
Entrepreneurship Education -> Risk propensity	1.000
Risk propensity -> Entrepreneurial Intention	3.862

Structural model and testing of hypotheses

Once the measurement model had met the established reliability and validity criteria, the analysis proceeded to structural model evaluation and hypothesis testing. Hypotheses were tested using a bootstrapping procedure with 5,000 subsamples. The significance of the hypothesized relationships was assessed based on path coefficients (β), t-values, p-values, and 95% bias-corrected and accelerated (BCa) confidence intervals. In addition to statistical significance, effect sizes (f^2) were examined to assess the substantive contribution of each exogenous construct to the corresponding endogenous construct.

As presented in Table 6, entrepreneurship education showed a positive and significant association with entrepreneurial intention ($\beta = 0.414$; $t = 13.427$; $p < 0.001$; 95% BCa CI [0.355, 0.475]), with a moderate effect size ($f^2 = 0.196$). Thus, H1 was supported. Entrepreneurship education was positively and significantly associated with all four dimensions of entrepreneurial mindset. Its associations with alertness to opportunity ($\beta = 0.733$; $t = 49.181$; $p < 0.001$; $f^2 = 1.164$) and risk propensity ($\beta = 0.759$; $t = 56.462$; $p < 0.001$; $f^2 = 1.355$) were accompanied by large effect sizes. The association with dispositional optimism was also positive and significant ($\beta = 0.676$; $t = 40.685$; $p < 0.001$; $f^2 = 0.842$), with a large effect size, whereas the association with ambiguity tolerance was positive and significant ($\beta = 0.695$; $t = 43.712$; $p < 0.001$; $f^2 = 0.065$), with a small effect size. Accordingly, H2a–H2d were supported.

Table 6. Structural Model Assessment and Hypothesis Testing Results.

Hypothesis	Relationship	β	t-value	p-value	95% BCa CI		Effect Size (f²)	Category	Decision
					2.5%	97.5%			
Direct effect									
H1	EE -> EI	0.414	13.427	0.000	0.355	0.475	0.196	Medium	Supported
H2a	EE -> AO	0.733	49.181	0.000	0.703	0.762	1.164	Large	Supported
H2b	EE -> RP	0.759	56.462	0.000	0.730	0.783	1.355	Large	Supported
H2c	EE -> AT	0.695	43.712	0.000	0.663	0.725	0.065	Small	Supported
H2d	EE -> DO	0.676	40.685	0.000	0.643	0.708	0.842	Large	Supported
H3a	AO -> EI	0.216	4.846	0.000	0.131	0.303	0.034	Small	Supported
H3b	RP -> EI	0.118	3.392	0.001	0.046	0.184	0.021	Small	Supported
H3c	AT -> EI	0.099	2.576	0.010	0.026	0.176	0.006	Very Small	Supported
H3d	DO -> EI	0.056	1.730	0.084	-0.005	0.122	0.002	No effect	Unsupported
Indirect effect									

Hypothesis	Relationship	β	t-value	p-value	95% BCa CI		Effect Size (f^2)	Category	Decision
					2.5%	97.5%			
H4a	EE → AO → EI	0.158	4.878	0.000	0.097	0.224			Supported
H4b	EE → RP → EI	0.090	3.390	0.001	0.035	0.139			Supported
H4c	EE → AT → EI	0.069	2.579	0.010	0.018	0.122			Supported
H4d	EE → DO → EI	0.038	1.739	0.082	-0.003	0.082			Unsupported

Note. EI= Entrepreneurial Intention, EE= Entrepreneurship Education, AO= Alertness to opportunity, RP= Risk propensity, AT= Ambiguity tolerance, DO= Dispositional optimism

Regarding the associations between the dimensions of entrepreneurial mindset and entrepreneurial intention, alertness to opportunity was positively and significantly associated with entrepreneurial intention ($\beta = 0.216$; $t = 4.846$; $p < 0.001$; 95% BCa CI [0.131, 0.303]), with a small effect size ($f^2 = 0.034$). Risk propensity was also positively and significantly associated with entrepreneurial intention ($\beta = 0.118$; $t = 3.392$; $p = 0.001$; 95% BCa CI [0.046, 0.184]), with a small effect size ($f^2 = 0.021$). Ambiguity tolerance likewise showed a positive and significant association with entrepreneurial intention ($\beta = 0.099$; $t = 2.576$; $p = 0.010$; 95% BCa CI [0.026, 0.176]). However, its f^2 value of 0.006 indicates a negligible substantive contribution to entrepreneurial intention. Thus, H3a, H3b, and H3c were supported. In contrast, dispositional optimism was not significantly associated with entrepreneurial intention ($\beta = 0.056$; $t = 1.730$; $p = 0.084$; 95% BCa CI [-0.005, 0.122]). Its f^2 value of 0.002 also indicates a negligible substantive contribution. Therefore, H3d was not supported.

Next, specific indirect effects were examined to assess the mediating role of each dimension of entrepreneurial mindset in the association between entrepreneurship education and entrepreneurial intention. Alertness to opportunity significantly mediated the association between entrepreneurship education and entrepreneurial intention ($\beta = 0.158$; $t = 4.878$; $p < 0.001$; 95% BCa CI [0.097, 0.224]). The indirect association through risk propensity was also significant ($\beta = 0.090$; $t = 3.390$; $p = 0.001$; 95% BCa CI [0.035, 0.139]), as was the indirect association through ambiguity tolerance ($\beta = 0.069$; $t = 2.579$; $p = 0.010$; 95% BCa CI [0.018, 0.122]). Because the confidence intervals for these three indirect effects did not include zero, H4a, H4b, and H4c were supported. In contrast, the indirect association through dispositional optimism was not significant ($\beta = 0.038$; $t = 1.739$; $p = 0.082$; 95% BCa CI [-0.003, 0.082]). Because the confidence interval included zero, H4d was not supported. These findings indicate that although entrepreneurship education was strongly associated with dispositional optimism, the indirect association between entrepreneurship education and entrepreneurial intention through dispositional optimism was not significant.

Furthermore, the structural model demonstrated substantial explanatory power, as indicated by the R^2 values reported in Table 7. Entrepreneurship education accounted for 53.8% of the variance in alertness to opportunity ($R^2 = 0.538$), 57.5% of the variance in risk propensity ($R^2 = 0.575$), 68.6% of the variance in ambiguity tolerance ($R^2 = 0.686$), and 45.7% of the variance in dispositional optimism ($R^2 = 0.457$). In addition, entrepreneurship education and the four dimensions of entrepreneurial mindset jointly accounted for 67.1% of the variance in entrepreneurial intention ($R^2 = 0.671$). These results indicate that the model provides substantial explanatory power for entrepreneurial intention, with the variance in entrepreneurial intention accounted for by both

entrepreneurship education and the distinct dimensions of entrepreneurial mindset included in the model.

Table 7. Coefficient of Determination (R^2).

Construct	R-square
Entrepreneurial Intention	0.671
Alertness to opportunity	0.538
Risk propensity	0.575
Ambiguity tolerance	0.686
Dispositional optimism	0.457

The final step involved evaluating the model's out-of-sample predictive ability using the PLSpredict procedure. As presented in Table 8, all indicators of the endogenous constructs had $Q^2_{predict}$ values greater than zero, ranging from 0.354 to 0.525, indicating that the model demonstrated predictive relevance (Shmueli et al., 2019). Furthermore, a comparison of the PLS-SEM_RMSE and LM_RMSE values showed that the PLS-SEM model generated lower prediction errors for most indicators than the linear model (LM). Taken together, these findings indicate that the proposed model demonstrates moderate out-of-sample predictive performance across the endogenous constructs, including alertness to opportunity, risk propensity, ambiguity tolerance, dispositional optimism, and entrepreneurial intention.

Table 8. Predictive Power Assessment Using PLSpredict.

Indicator	$Q^2_{predict}$	PLS-SEM_RMSE	LM_RMSE
AO1	0.463	0.641	0.643
AO2	0.422	0.668	0.669
AO3	0.446	0.643	0.645
AO4	0.431	0.667	0.669
AT1	0.405	0.661	0.662
AT2	0.389	0.673	0.674
AT3	0.400	0.671	0.671
AT4	0.362	0.688	0.689
DO1	0.356	0.689	0.689
DO2	0.398	0.673	0.674
DO3	0.390	0.688	0.689
EI1	0.376	0.743	0.744
EI2	0.354	0.713	0.713
EI3	0.458	0.657	0.658
EI4	0.505	0.653	0.652
EI5	0.458	0.664	0.665
EI6	0.525	0.637	0.633
RP1	0.509	0.606	0.603
RP2	0.442	0.648	0.648
RP3	0.473	0.622	0.622

Discussion

This study examined the statistical relationships between entrepreneurship education (EE) and entrepreneurial intention (EI), with particular attention to four dimensions of entrepreneurial mindset: alertness to opportunity (AO), risk propensity (RP), ambiguity tolerance (AT), and dispositional optimism (DO). The findings reveal three main patterns. First, EE was positively and significantly associated with EI and with all four dimensions of entrepreneurial mindset. Second, AO, RP, and AT showed significant indirect associations in the relationship between EE and EI, although their magnitudes differed. Third, DO showed a contrasting pattern: although EE was significantly associated with DO, DO was not significantly associated with EI and did not show a significant indirect association between EE and EI. These findings reinforce the importance of treating entrepreneurial mindset as a multidimensional construct rather than as a homogeneous psychological characteristic. However, given the cross-sectional design, these relationships should be interpreted as statistical associations within the proposed model rather than as evidence of causal processes.

The finding that entrepreneurship education was positively and significantly associated with entrepreneurial intention indicates that students who perceived their entrepreneurship education more positively also tended to report stronger intentions to pursue entrepreneurship as a career path (Bae et al., 2014; Cui & Gu, 2024; Zhang et al., 2022). This finding is consistent with previous research showing that entrepreneurship education is associated with entrepreneurial intention through relevant knowledge, skills, experiential learning, and opportunities to engage in entrepreneurial activities (Arief, 2021; Puni et al., 2018; Sun et al., 2023; Uddin et al., 2022). From this perspective, entrepreneurship education extends beyond the transmission of entrepreneurial knowledge by providing learning experiences that are associated with students' cognitive and psychological orientations toward pursuing entrepreneurial careers.

One key finding of this study concerns the relationship between entrepreneurship education and the four dimensions of the entrepreneurial mindset. Entrepreneurship education showed strong associations with alertness to opportunity, risk propensity, and dispositional optimism, whereas its association with ambiguity tolerance was comparatively smaller. These findings indicate that entrepreneurship education is related not only to the acquisition of business-related knowledge but also to several cognitive and dispositional characteristics relevant to entrepreneurial decision-making (Chevalier et al., 2022; Cui, 2021b). The particularly strong association between entrepreneurship education and risk propensity is noteworthy. Risk propensity reflects an individual's willingness to consider and pursue courses of action despite uncertainty regarding their potential outcomes (Ilevbare et al., 2022; Ozaralli & Rivenburgh, 2016). Entrepreneurship education may provide students with opportunities to make decisions under conditions of incomplete information, evaluate alternative courses of action, and experience the possibility of failure (Bandera et al., 2018). Such learning experiences may be relevant to how students perceive and evaluate risk in entrepreneurial decision-making (Arpiainen & Kurczewska, 2017).

The strong statistical association between entrepreneurship education and alertness to opportunity also has important implications. Alertness to opportunity concerns an individual's ability to actively seek information, connect seemingly unrelated pieces of information, and evaluate whether such information may represent a potential

entrepreneurial opportunity (Alshahrani et al., 2026; Soni & Bakhru, 2023). Entrepreneurship education therefore represents a relevant learning context in which students may encounter activities involving environmental scanning, information interpretation, and opportunity evaluation. Through entrepreneurship learning experiences, students may engage with diverse information cues and consider their potential entrepreneurial relevance (Saadat et al., 2022; Tang et al., 2012). Further empirical evidence has reported associations between entrepreneurship education, entrepreneurial alertness, and entrepreneurial intention (Hoang et al., 2023; Otache et al., 2024).

In contrast, although entrepreneurship education was significantly associated with ambiguity tolerance, the magnitude of this association was relatively smaller than its associations with alertness to opportunity, risk propensity, and dispositional optimism. This finding is theoretically noteworthy because ambiguity tolerance has been characterized as a relatively stable individual difference (McLain et al., 2015), although experimental evidence suggests that it may also exhibit some degree of malleability under specific learning conditions (Endres et al., 2015). In the context of entrepreneurship education, differences in the magnitude of associations across the dimensions of entrepreneurial mindset may reflect the fact that pedagogical approaches do not necessarily engage all dimensions to the same extent. Experience- and action-based learning, for example, may expose students to opportunities to identify and evaluate information, experiment with alternative approaches, and experience the consequences of their decisions (Arpiainen & Kurczewska, 2017; Bandera et al., 2018; Hoang et al., 2023; Saadat et al., 2022). By contrast, ambiguity tolerance may require more intensive and sustained exposure to uncertain, complex, and unstructured learning situations (De Sandt & Mauer, 2019; Peschl et al., 2021). Importantly, although the association between ambiguity tolerance and entrepreneurial intention was statistically significant, its effect size was very small. Therefore, this statistical significance, potentially facilitated by the large sample size, should not be interpreted as evidence of a substantively strong contribution of ambiguity tolerance to entrepreneurial intention. Rather, the very small effect indicates that ambiguity tolerance has limited practical relevance in explaining students' entrepreneurial intention. This finding further highlights the differentiated nature of the four entrepreneurial mindset dimensions and underscores the importance of considering both statistical significance and effect magnitude when interpreting their relationships with entrepreneurial intention.

The findings can be interpreted through the lens of Social Cognitive Theory (SCT), particularly its principle of reciprocal determinism. SCT conceptualizes human functioning as resulting from reciprocal interactions among environmental, personal-cognitive, and behavioral factors (Bandura, 2001; Schunk & Usher, 2012). In the present study, entrepreneurship education represents an environmental and learning context (Nwosu et al., 2022; Tong et al., 2025), the four dimensions of entrepreneurial mindset represent personal-cognitive characteristics (Haynie et al., 2010; Mawson et al., 2023), and entrepreneurial intention reflects a motivational orientation toward future entrepreneurial behavior (Liñán & Chen, 2009). The significant associations between entrepreneurship education and AO, RP, AT, and DO indicate that students reporting more positive entrepreneurship education experiences also tended to report stronger levels of these personal-cognitive orientations. This pattern is broadly consistent with

SCT, which proposes that environmental influences interact with personal cognitive factors and behavior rather than functioning as independent determinants (Bandura, 2001).

More importantly, the mediation results provide a differentiated picture of the personal-cognitive component proposed by SCT. AO, RP, and AT showed significant indirect associations in the relationship between EE and EI, whereas DO did not. This pattern suggests that the personal-cognitive characteristics represented by entrepreneurial mindset do not exhibit uniform statistical relationships with entrepreneurial intention. Rather, the association between entrepreneurship education and entrepreneurial intention may vary depending on the specific cognitive-dispositional characteristic through which the relationship is examined. This finding highlights the importance of considering the multidimensional nature of entrepreneurial mindset rather than treating it as a homogeneous construct. This interpretation is also consistent with the view that entrepreneurial mindset encompasses distinct cognitive and metacognitive processes that may play different roles in entrepreneurial decision-making (Haynie et al., 2010; Mawson et al., 2023). Thus, the findings offer a differentiated empirical interpretation of the personal-cognitive component within the SCT framework, environmental and personal-cognitive factors are interconnected, but their statistical relevance to specific behavioral intentions may vary across personal characteristics (Bandura, 2001; Nwosu et al., 2022).

The results indicate that three dimensions of entrepreneurial mindset—alertness to opportunity (AO), risk propensity (RP), and ambiguity tolerance (AT)—showed significant indirect associations between entrepreneurship education (EE) and entrepreneurial intention (EI), although the magnitude of these associations varied across dimensions. Among these dimensions, AO exhibited the largest indirect association. This finding suggests that students who reported more positive entrepreneurship education experiences also tended to report higher levels of alertness to opportunity, which was, in turn, associated with stronger entrepreneurial intention. The relatively larger indirect association involving AO is consistent with the opportunity recognition perspective, which emphasizes the identification and evaluation of entrepreneurial opportunities as important cognitive processes in entrepreneurship (Baron, 2006; Hassan et al., 2020). Students with greater alertness to opportunity may be more attentive to potentially relevant information and better able to recognize connections among seemingly unrelated information, thereby facilitating the identification of entrepreneurial opportunities and strengthening entrepreneurial intention (Otache et al., 2024; Thomas, 2023). This finding is also consistent with previous research indicating that entrepreneurial alertness can function as an indirect mechanism linking entrepreneurship education with entrepreneurial intention (Hoang et al., 2023; Otache et al., 2024).

The stronger mediating role of AO suggests that alertness to opportunity may represent an important initial cognitive mechanism in the formation of entrepreneurial intention, whereas RP and AT may function as complementary capacities that enable students to respond to identified opportunities. The findings indicate that both RP and AT had positive and significant effects on EI, although their effect sizes were smaller than that of AO. This pattern suggests that, within the present model, the cognitive process of identifying potential opportunities may play a more prominent role in shaping

entrepreneurial intention than the willingness to accept risk or the ability to tolerate ambiguity. From a process perspective, students may first need to perceive and evaluate potentially valuable opportunities before risk propensity and ambiguity tolerance become relevant to subsequent entrepreneurial decision-making (Tang et al., 2012, 2023). Risk propensity may enable students to accept the possibility of failure or uncertain outcomes (Ndofirepi, 2020), whereas ambiguity tolerance may allow them to remain functional and make decisions when available information is incomplete or unclear (Peschl et al., 2021). Accordingly, these three dimensions can be understood as complementary mechanisms within the entrepreneurial decision-making process: AO helps students identify potential opportunities, RP provides a willingness to confront the risks associated with pursuing them, and AT enables students to act despite incomplete or uncertain information.

The significant role of alertness to opportunity (AO) in the present study can also be interpreted in relation to perceived behavioral control (PBC), a central component of Ajzen (1991) Theory of Planned Behavior (TPB). Although AO and PBC represent distinct constructs, they address complementary aspects of entrepreneurial intention. PBC reflects an individual's perception of the capability and control required to perform entrepreneurial behavior (Liñán & Chen, 2009), whereas AO concerns the ability to notice, connect, and evaluate potential entrepreneurial opportunities (Alshahrani et al., 2026; Soni & Bakhru, 2023). Thus, PBC is primarily concerned with whether an individual perceives that he or she can perform entrepreneurial behavior, while AO concerns whether the individual is able to recognize potential opportunities for such behavior. Similarly, the significant role of risk propensity (RP) in the present study can be related to propensity to act in the Entrepreneurial Event Model (EEM) proposed by Shapero and Sokol (1982) (Krueger Jr et al., 2000). Although RP and propensity to act are conceptually distinct, both represent individual dispositions that may be relevant to entrepreneurial action. Propensity to act refers to an individual's tendency to act on decisions or opportunities (Krueger Jr et al., 2000), whereas RP reflects the tendency to accept or tolerate risk associated with uncertain outcomes (Ilevbare et al., 2022; Ozaralli & Rivenburgh, 2016). The significant association between RP and entrepreneurial intention in the present study is therefore broadly consistent with the EEM perspective, while suggesting that risk-related disposition may represent an additional personal characteristic associated with entrepreneurial intention (Krueger Jr et al., 2000).

The findings also reveal a contrasting pattern for dispositional optimism. Although EE was significantly associated with DO, DO was not significantly associated with EI and did not show a significant indirect association between EE and EI. One possible explanation concerns the difference in the level of specificity represented by the two constructs. DO reflects relatively general positive expectations about future outcomes, whereas EI represents a more specific intention to pursue entrepreneurial activities. Students may therefore hold positive expectations about their future without necessarily identifying entrepreneurship as their preferred career or activity (Maftai et al., 2023). This interpretation is consistent with research suggesting that optimism does not uniformly correspond to positive entrepreneurial outcomes. Hmieleski & Baron (2009), for example, showed that optimism may have complex relationships with entrepreneurial outcomes, while Lindblom et al. (2020) suggested that the relevance of dispositional optimism may depend on other psychological processes and contextual conditions. Thus, the non-

significant association between DO and EI does not imply that optimism is irrelevant to entrepreneurship. Rather, DO may be a more general or distal personal characteristic whose relevance to entrepreneurial intention depends on more proximal cognitive factors.

One possible theoretical explanation is that DO represents a relatively distal psychological disposition characterized by generalized expectations of positive future outcomes (Carver & Scheier, 2001). From Ajzen (1991, 2020) principle of compatibility, such a general disposition may have limited direct explanatory relevance for a specific behavioral intention unless it is connected to beliefs that are more closely aligned with the target behavior. In the entrepreneurial context, this connection may occur through more proximal mechanisms. Social Cognitive Theory suggests that entrepreneurial self-efficacy, or confidence in one's capability to perform entrepreneurial tasks, may provide such a mechanism and has been associated with entrepreneurial intention (Bandura, 2001; Zhao et al., 2005). Similarly, entrepreneurial alertness may connect general positive expectations with entrepreneurship by facilitating the identification, connection, and evaluation of potential opportunities (Tang et al., 2012). These mechanisms, however, were not examined in the present study. Therefore, the proposed role of entrepreneurial self-efficacy and entrepreneurial alertness should be regarded as a theoretical interpretation of the non-significant DO-EI relationship rather than as an empirically established mechanism in the present findings.

CONCLUSION

Fundamental Finding: The fundamental finding of this study is that the association between entrepreneurship education and entrepreneurial intention is differentiated across dimensions of entrepreneurial mindset. Although entrepreneurship education was positively and significantly associated with entrepreneurial intention and all four dimensions of entrepreneurial mindset, only alertness to opportunity, risk propensity, and ambiguity tolerance showed significant indirect associations with entrepreneurial intention. Among these dimensions, alertness to opportunity showed the largest indirect association, whereas dispositional optimism was not significantly associated with entrepreneurial intention and did not exhibit a significant indirect association. These findings indicate that the relevance of entrepreneurial mindset to entrepreneurial intention varies across its specific dimensions rather than operating as a homogeneous psychological construct. **Implication:** The findings have important theoretical and practical implications. Theoretically, this study offers three main contributions. First, from a Social Cognitive Theory (SCT) perspective, the findings show that entrepreneurship education is associated with different personal-cognitive dimensions of entrepreneurial mindset, although these dimensions do not exhibit uniform relationships with entrepreneurial intention. Second, the study contributes to the entrepreneurship education literature by showing that the relationship between entrepreneurship education and entrepreneurial intention is associated with specific dimensions of entrepreneurial mindset, particularly AO, RP, and AT. Third, the findings contribute to the entrepreneurial mindset literature by demonstrating that its dimensions exhibit different relationships with entrepreneurial intention: AO showed the largest indirect association, RP and AT also showed significant indirect associations, whereas DO was not significant. This supports the value of examining entrepreneurial mindset as

a multidimensional rather than homogeneous construct. Practically, entrepreneurship education can incorporate activities targeting specific dimensions of entrepreneurial mindset. AO can be developed through environmental scanning, customer-needs identification, and opportunity-recognition projects; RP through project-based learning, business plan competitions, and risk-decision simulations; and AT through ambiguous case studies and reflective journaling. Mentoring and startup internships can further expose students to real entrepreneurial situations. At the institutional level, higher education policymakers can support these efforts by integrating entrepreneurship education across curricula, providing resources for experiential learning, and strengthening partnerships with entrepreneurs and industry. Such institutional support can facilitate the systematic development of differentiated entrepreneurial mindset dimensions. **Limitation:** This study has several limitations. First, its cross-sectional design limits the ability to establish temporal ordering or causal relationships among entrepreneurship education, entrepreneurial mindset, and entrepreneurial intention. Second, the use of self-reported data and a single survey method may introduce response bias, social desirability bias, and potential common method bias. Third, the model does not account for potentially relevant control variables, such as prior entrepreneurial experience, family business background, or academic discipline. Fourth, the focus on university students may limit the generalizability of the findings to other populations and contexts. Finally, only four dimensions of entrepreneurial mindset were examined, leaving other potentially relevant personal-cognitive characteristics unexplored. **Future research:** Future research should employ longitudinal or quasi-experimental designs to examine temporal relationships among the study variables and test moderated mediation involving factors such as prior entrepreneurial experience, gender, and academic discipline. Future studies could also compare unidimensional and multidimensional models of entrepreneurial mindset and examine whether dispositional optimism is more relevant to outcomes such as entrepreneurial persistence, well-being, resilience, or coping. Incorporating behavioral outcomes, such as entrepreneurial projects, startup internships, or actual business creation, could further determine whether these relationships extend beyond entrepreneurial intention.

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