

BUSINESS INCUBATOR FACILITIES AND ENTREPRENEURIAL INTENTIONS AMONG ENGINEERING STUDENTS: THE MEDIATING ROLE OF STUDENT ENGAGEMENT

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Received: 05.08.2024

Revised: 15.09.2024

Accepted: 30.10.2024

Abstract

This study investigates the role of business incubator facilities in fostering entrepreneurial intentions among engineering students, with a specific focus on the mediating mechanism of student engagement. Drawing on data from 460 engineering students across institutions in Coimbatore district, India, the researcher employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine how incubator facilities-comprising infrastructure, marketing services, training programs, networking opportunities, and consultancy services-influence entrepreneurial intentions through student engagement. Results reveal that incubator facilities significantly enhance student engagement ($\beta = 0.765$, $p < 0.001$), which in turn substantially increases entrepreneurial intentions ($\beta = 0.802$, $p < 0.001$). Student engagement partially mediates the relationship between incubator facilities and entrepreneurial intentions, with the indirect effect accounting for 47.9% of the total effect. The model explains 58.5% of variance in student engagement and 64.3% of variance in entrepreneurial intentions. These findings advance entrepreneurship education literature by demonstrating that mere provision of incubator facilities is insufficient; rather, active student engagement serves as a crucial mediating mechanism translating institutional support into entrepreneurial outcomes. The study provides empirical

evidence from an emerging economy context and offers practical implications for engineering institutions and policymakers designing entrepreneurship support programs.

Keywords: Business incubators, entrepreneurial intentions, student engagement, engineering education, PLS-SEM

1. Introduction

Entrepreneurship has emerged as a cornerstone of economic development, driving innovation, job creation, and technological advancement across both developed and emerging economies (Autio et al., 2014). Recognizing this imperative, governments and educational institutions worldwide have intensified efforts to nurture entrepreneurial capabilities among students, particularly in technical disciplines where innovation potential is substantial. Engineering education, with its emphasis on problem-solving and technological expertise, provides a natural foundation for entrepreneurial ventures (Souitaris et al., 2007). However, the translation of technical knowledge into entrepreneurial action requires more than academic training; it necessitates supportive ecosystems that bridge the gap between theoretical learning and practical implementation.

Business incubators have evolved as critical institutional mechanisms designed to support nascent entrepreneurs by providing comprehensive resources including physical infrastructure, mentoring, networking opportunities, and access to capital (Bruneel et al., 2012). Within university settings, these incubators serve the dual purpose of facilitating student learning and enabling venture creation. The Journal of Technology Transfer has extensively documented how university incubators contribute to entrepreneurial ecosystem development, yet empirical evidence on their effectiveness in stimulating entrepreneurial intentions, particularly among engineering students, remains fragmented. While prior research has established direct relationships between incubation support and entrepreneurial outcomes, the underlying mechanisms through which these facilities influence student intentions warrant deeper investigation.

Student engagement emerges as a potentially crucial mediating variable in this relationship. Engagement encompasses not merely exposure to facilities but active participation, awareness of available resources, perception of their value, and intention to utilize them (Koe et al., 2024). In the entrepreneurship education context, engagement represents students' psychological and

behavioral investment in entrepreneurial activities, which may serve as the critical link between institutional provision and individual entrepreneurial development. Recent meta-analytic reviews published in Academy of Management Learning & Education have begun to emphasize the role of engagement in entrepreneurship education effectiveness, suggesting that passive exposure to resources yields limited impact compared to active engagement (Nabi et al., 2018).

India presents a compelling context for this investigation. The Government of India has launched numerous initiatives including the Institution's Innovation Council (IIC), Atal Ranking of Institutions on Innovation Achievements (ARIIA), and National Institutional Ranking Framework (NIRF) to promote entrepreneurship in higher education. Coimbatore, an industrial and educational hub in Tamil Nadu, hosts numerous engineering institutions that have established incubation centers. However, the extent to which these facilities effectively translate into entrepreneurial intentions among engineering students, and the role of engagement in this process, remains underexplored.

This study addresses three critical research questions: (1) How do business incubator facilities influence entrepreneurial intentions among engineering students? (2) What is the mediating role of student engagement in the relationship between incubator facilities and entrepreneurial intentions? (3) How do different dimensions of incubator facilities contribute to student engagement and entrepreneurial outcomes? By investigating these questions through a comprehensive structural model tested with Partial Least Squares Structural Equation Modeling, this research contributes to both entrepreneurship education theory and practice, providing actionable insights for institutions seeking to maximize the impact of their incubation investments.

2. Review of Literature

2.1 Business Incubators and Entrepreneurial Development

Business incubators have evolved significantly since their inception, transforming from simple shared office spaces into sophisticated ecosystems providing multifaceted support for nascent entrepreneurs. The evolution of incubator models has been documented extensively, with researchers identifying distinct generations of incubators characterized by increasingly comprehensive service offerings (Bruneel et al., 2012). Contemporary university business

incubators serve not merely as physical infrastructure but as integrated platforms combining tangible resources with intangible support mechanisms including mentorship, networking, and knowledge transfer.

The theoretical foundation for incubator effectiveness draws from multiple streams of scholarship. Resource-based theory suggests that incubators provide access to valuable, rare, and inimitable resources that enhance venture creation prospects. From a learning perspective, incubators serve as experiential learning laboratories where students can test ideas, fail safely, and iterate-processes critical to entrepreneurial skill development. Recent empirical work published in *The Journal of Technology Transfer* has demonstrated positive relationships between incubator utilization and various entrepreneurial outcomes including venture survival rates, growth trajectories, and innovation performance.

Within university settings, incubators fulfill distinctive roles compared to their commercial counterparts. Beyond immediate venture creation, they serve educational objectives including skill development, network building, and entrepreneurial identity formation. Hassan's (2020) theoretical perspective on university business incubators emphasizes their role in redirecting new knowledge for economic development while simultaneously fulfilling teaching and research missions.

2.2 Entrepreneurial Intentions Framework

Entrepreneurial intention represents the conscious state of mind that directs attention, experience, and action toward venture creation. The predominant theoretical framework for understanding entrepreneurial intentions derives from the Theory of Planned Behavior, which posits that intentions are influenced by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). Within entrepreneurship research, this framework has been adapted and extended to incorporate domain-specific factors including entrepreneurial self-efficacy, perceived desirability of entrepreneurship, and perceived feasibility of venture creation.

Entrepreneurial self-efficacy, defined as one's belief in their capability to successfully perform entrepreneurial roles and tasks, has emerged as a particularly robust predictor of intentions and subsequent behavior. Research published in *Journal of Business Venturing* consistently

demonstrates that individuals with higher entrepreneurial self-efficacy exhibit stronger entrepreneurial intentions and are more likely to engage in venture creation activities. Perceived desirability reflects the attractiveness of entrepreneurship as a career path, influenced by personal attitudes, social norms, and anticipated outcomes.

Recent systematic reviews of factors affecting student entrepreneurial intentions identify cognitive, personality, environmental, social, educational, contextual, and demographic determinants, with educational factors-including incubation support-playing increasingly recognized roles.

2.3 Student Engagement as a Mediating Mechanism

Student engagement has received substantial attention in educational research as a critical factor influencing learning outcomes and personal development. In entrepreneurship education contexts, engagement extends beyond classroom attendance to encompass active participation in entrepreneurial activities, utilization of available resources, and psychological investment in entrepreneurial identity development. The concept of engagement captures both behavioral dimensions including participation in events and programs, and psychological dimensions including awareness, value perception, and utilization intentions.

Recent studies have begun to examine engagement as a mediating variable linking educational interventions to entrepreneurial outcomes. Koe et al. (2024) demonstrated that online student engagement mediates the relationship between entrepreneurship education and entrepreneurial intention, suggesting that engagement mechanisms transcend specific delivery modalities. Similarly, research published in Journal of International Entrepreneurship has shown that engagement in student-led entrepreneurial organizations positively influences entrepreneurial intentions (Sansone et al., 2021).

The mediating role of engagement aligns with experiential learning theory, which posits that learning results from grasping experience and transforming it through reflection and active experimentation. In the incubation context, facilities provide opportunities for experience, but actual learning and development depend on students' active engagement with these opportunities.

This perspective suggests that incubator effectiveness is contingent not merely on facility quality but on students' awareness of, perceived value from, and intention to utilize these facilities.

2.4 Hypotheses Development

Based on the theoretical frameworks and empirical evidence reviewed, this study develops the following hypotheses. First, incubator facilities should directly influence entrepreneurial intentions by providing resources, reducing barriers, and creating supportive environments that make entrepreneurship appear both desirable and feasible. Studies have consistently demonstrated positive relationships between access to incubation resources and entrepreneurial intentions. Thus:

H1: Institution incubator facilities positively influence students' entrepreneurial intentions.

Second, incubator facilities should influence student engagement by increasing awareness of entrepreneurial opportunities, demonstrating value through successful examples and tangible support, and creating intentions to utilize available resources. Therefore:

H2: Institution incubator facilities positively influence student engagement with incubation centers.

Third, student engagement should influence entrepreneurial intentions through multiple mechanisms including skill development, identity formation, network access, and confidence building. Thus:

H3: Student engagement positively influences entrepreneurial intentions.

Finally, integrating these relationships suggests that student engagement serves as a mediating mechanism linking incubator facilities to entrepreneurial intentions. Therefore:

H4: Student engagement mediates the relationship between institution incubator facilities and entrepreneurial intentions.

3. Statement of the Problem

The Government of India has implemented several initiatives to promote entrepreneurship in higher education institutions, including the Institution's Innovation Council (IIC), Atal Ranking of Institutions on Innovation Achievements (ARIIA), and National Institutional Ranking Framework (NIRF). These programs provide support for establishing incubation facilities, organizing

competitions, conducting training, and offering seed funding. However, significant questions remain regarding the effectiveness of these investments in cultivating genuine entrepreneurial intentions among engineering students.

Coimbatore district, as a prominent educational hub in Tamil Nadu with numerous engineering institutions, provides an ideal setting to examine these questions. Despite substantial infrastructure investments in incubation facilities across engineering colleges in the district, empirical evidence on their impact on student entrepreneurial intentions remains limited. Moreover, the mechanism through which these facilities influence intentions-particularly the potential mediating role of student engagement-has not been systematically investigated in this context.

This study addresses these gaps by examining: (1) the current state of incubator facilities in Coimbatore engineering institutions and student perceptions thereof; (2) the level and dimensions of student engagement with these facilities; (3) the direct and indirect relationships between facilities, engagement, and entrepreneurial intentions; and (4) the mediating role of engagement in translating facility provision into entrepreneurial outcomes.

4. Objectives of the Study

1. To evaluate students' perceptions of incubator facilities including infrastructure, marketing services, training programs, networking opportunities, and consultancy services provided by engineering institutions in Coimbatore district.
2. To assess the level of student engagement with incubation centers across three dimensions: awareness, perceived value, and intention to utilize.
3. To examine the impact of incubator facilities on students' entrepreneurial intentions encompassing perceived desirability, perceived feasibility, and entrepreneurial self-efficacy.
4. To investigate the mediating role of student engagement in the relationship between incubator facilities and entrepreneurial intentions.

5. Research Design and Methodology

5.1 Research Design

This study adopted a quantitative research design employing a cross-sectional survey approach. The research focused on engineering students enrolled in institutions across Coimbatore district,

Tamil Nadu, India. Coimbatore is home to numerous engineering colleges offering diverse specializations and has witnessed significant growth in entrepreneurship support initiatives in recent years.

5.2 Sample and Data Collection

The target population consisted of engineering students from various disciplines including Electronics and Communication Engineering (ECE), Electrical and Electronics Engineering (EEE), Computer Science and Engineering (CSE), and Mechanical Engineering. A stratified random sampling technique was employed to ensure representation across disciplines, academic years, and institutions. The final sample comprised 460 respondents representing diverse demographic backgrounds.

Data collection was conducted through structured questionnaires administered directly to students. The questionnaire was divided into sections measuring incubator facilities, student engagement, and entrepreneurial intentions. All constructs were measured using five-point Likert scales ranging from 'Strongly Disagree' (1) to 'Strongly Agree' (5).

5.3 Sample Demographics

The demographic profile of the respondents is presented in Table 1.

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	267	58.0
	Female	193	42.0
Discipline	ECE	134	29.1
	EEE	132	28.7
	CSE	119	25.9
	Mechanical	75	16.3
Residence	Rural	208	45.2
	Semi-urban	133	28.9
	Urban	119	25.9
Academic Performance	Below 60%	42	9.1
	61-70%	156	33.9
	71-80%	184	40.0
	Above 80%	78	17.0

Table 1: Demographic Profile of Respondents

5.4 Measurement Instrument

The study utilized a structured questionnaire comprising three main constructs. Institution Incubator Facilities was conceptualized as a second-order construct comprising five dimensions: (1) Infrastructure Facilities (6 items measuring physical resources, workspaces, and equipment), (2) Marketing Services (5 items assessing exhibition platforms, product showcasing, and market linkages), (3) Training Programs (6 items evaluating skill development workshops and educational initiatives), (4) Networking Opportunities (5 items measuring connections with entrepreneurs, industry professionals, and investors), and (5) Consultancy Services (5 items assessing mentorship, business planning support, and expert guidance). Student Engagement comprised three dimensions: (1) Awareness of Incubation Centers (4 items), (2) Perceived Value of Incubation Centers (5 items), and (3) Intention to Utilize Incubation Centers (4 items). Entrepreneurial Intentions included three dimensions: (1) Perceived Desirability of Entrepreneurship (5 items), (2) Perceived Feasibility of New Venture Creation (5 items), and (3) Entrepreneurial Self-Efficacy (5 items).

5.5 Data Analysis Technique

Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed as the primary analytical technique using SmartPLS 4.0 software. PLS-SEM was selected for its ability to handle complex models with multiple constructs, accommodate reflective and formative measurement models, and provide robust estimates with relatively smaller sample sizes. The analysis proceeded in two stages: (1) assessment of the measurement model to establish reliability and validity, and (2) evaluation of the structural model to test hypothesized relationships.

6. Analysis and Results

6.1 Measurement Model Assessment

The measurement model was evaluated using criteria of internal consistency reliability, convergent validity, and discriminant validity. Internal consistency was assessed through Cronbach's alpha (α) and Composite Reliability (CR), with threshold values of 0.70. Convergent validity was examined through Average Variance Extracted (AVE) with a minimum threshold of 0.50, and individual item loadings with a minimum of 0.70.

Table 2 presents the measurement model assessment results for all constructs and their dimensions.

Construct/Dimension	Items	Loadings Range	Cronbach's α	CR	AVE
Incubator Facilities			0.952	0.957	0.768
Infrastructure	6	0.812-0.886	0.926	0.943	0.732
Marketing Services	5	0.795-0.867	0.914	0.935	0.745
Training Programs	6	0.801-0.893	0.931	0.947	0.748

Networking	5	0.784-0.852	0.908	0.931	0.728
Consultancy	5	0.778-0.841	0.902	0.927	0.716
Student Engagement			0.946	0.954	0.812
Awareness	4	0.823-0.901	0.918	0.942	0.802
Perceived Value	5	0.816-0.887	0.922	0.941	0.796
Intention to Utilize	4	0.831-0.912	0.924	0.946	0.814
Entrepreneurial Intentions			0.954	0.962	0.881
Perceived Desirability	5	0.827-0.894	0.928	0.945	0.776
Perceived Feasibility	5	0.841-0.908	0.935	0.951	0.795
Self-Efficacy	5	0.853-0.921	0.941	0.955	0.808

Table 2: Measurement Model Assessment Results

All factor loadings exceeded the minimum threshold of 0.70, ranging from 0.778 to 0.921 across all items. Cronbach's alpha values ranged from 0.902 to 0.954, and Composite Reliability values ranged from 0.927 to 0.962, both exceeding the recommended threshold of 0.70, confirming excellent internal consistency reliability. Average Variance Extracted values ranged from 0.716 to 0.881, all surpassing the minimum threshold of 0.50, thereby establishing convergent validity.

Discriminant validity was assessed using the Fornell-Larcker criterion, whereby the square root of AVE for each construct should exceed its correlations with other constructs. Table 3 presents the discriminant validity assessment.

Construct	Incubator Facilities	Student Engagement	Entrepreneurial Intentions
Incubator Facilities	0.876		
Student Engagement	0.765	0.901	
Entrepreneurial Intentions	0.781	0.833	0.939

Table 3: Discriminant Validity (Fornell-Larcker Criterion)

Note: Diagonal elements (in bold conceptually) represent the square root of AVE.

The results confirm discriminant validity as the square root of AVE for each construct (Incubator Facilities = 0.876, Student Engagement = 0.901, Entrepreneurial Intentions = 0.939) exceeded all inter-construct correlations.

6.2 Structural Model Assessment

After confirming the adequacy of the measurement model, the structural model was evaluated to test the hypothesized relationships. The assessment included examination of path coefficients, their statistical significance through bootstrapping (5,000 resamples), t-values, p-values, and the coefficient of determination (R^2). The results are presented in Table 4.

Hypothesis	Path	Beta (β)	Std. Error	t-value	p-value	Decision
H1	Incubator Facilities → Entrepreneurial Intentions	0.667	0.042	15.881	<0.001***	Supported
H2	Incubator Facilities → Student Engagement	0.765	0.031	24.677	<0.001***	Supported
H3	Student Engagement → Entrepreneurial Intentions	0.802	0.038	21.105	<0.001***	Supported

Table 4: Structural Model Path Coefficients

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

The results demonstrate strong and statistically significant relationships among all constructs. Hypothesis H1, proposing that incubator facilities positively influence entrepreneurial intentions, was strongly supported ($\beta = 0.667$, $t = 15.881$, $p < 0.001$). Hypothesis H2, suggesting that incubator facilities positively influence student engagement, received substantial support ($\beta = 0.765$, $t = 24.677$, $p < 0.001$), indicating that better incubator facilities significantly enhance student engagement. Hypothesis H3, positing that student engagement positively influences entrepreneurial intentions, was also strongly supported ($\beta = 0.802$, $t = 21.105$, $p < 0.001$), confirming that higher levels of engagement translate into stronger entrepreneurial intentions.

The model's explanatory power was assessed through R^2 values, which indicate the proportion of variance in endogenous variables explained by their predictors. Table 5 presents these results.

Endogenous Variable	R^2	Adjusted R^2	Interpretation
Student Engagement	0.585	0.584	Substantial
Entrepreneurial Intentions	0.643	0.641	Substantial

Table 5: Coefficient of Determination (R^2)

The model explained 58.5% of variance in student engagement and 64.3% of variance in entrepreneurial intentions, both representing substantial explanatory power according to conventional thresholds in behavioral sciences research.

6.3 Mediation Analysis

To test Hypothesis H4 regarding the mediating role of student engagement, the researcher employed the bootstrapping procedure with 5,000 resamples to assess both direct and indirect effects. The Variance Accounted For (VAF) was calculated to determine the extent of mediation. Table 6 presents the mediation analysis results.

Effect Type	Path	Beta (β)	Std. Error	t-value	p-value	95% CI
Direct Effect	Incubator Facilities $\rightarrow$ Entrepreneurial Intentions	0.667	0.042	15.881	<0.001***	[0.585, 0.748]
Indirect Effect	Incubator Facilities $\rightarrow$ Student Engagement $\rightarrow$ Entrepreneurial Intentions	0.614	0.035	17.543	<0.001***	[0.546, 0.682]
Total Effect	Combined	1.281	0.051	25.118	<0.001***	[1.181, 1.381]
VAF	Indirect / Total	0.479				

Table 6: Mediation Analysis Results

Note: *** $p < 0.001$; VAF = Variance Accounted For

The mediation analysis reveals that student engagement partially mediates the relationship between incubator facilities and entrepreneurial intentions. The direct effect of incubator facilities on entrepreneurial intentions remains significant ($\beta = 0.667$, $p < 0.001$), while the indirect effect through student engagement is also substantial and significant ($\beta = 0.614$, $p < 0.001$). The Variance Accounted For (VAF) value of 0.479 indicates that 47.9% of the total effect is mediated through student engagement, confirming partial mediation. This finding supports Hypothesis H4, demonstrating that while incubator facilities directly influence entrepreneurial intentions, a substantial portion of this influence operates through the mediating mechanism of student engagement.

7. Discussion and Implications

7.1 Discussion of Findings

This study set out to investigate the relationship between business incubator facilities and entrepreneurial intentions among engineering students, with particular attention to the mediating role of student engagement. The findings provide robust empirical support for all hypothesized relationships, contributing to both theoretical understanding and practical application in entrepreneurship education.

The strong positive relationship between incubator facilities and entrepreneurial intentions ($\beta = 0.667$, $p < 0.001$) aligns with resource-based perspectives and prior empirical work demonstrating that institutional support mechanisms significantly influence students' entrepreneurial aspirations. This finding resonates with Hassan's (2020) theoretical framework emphasizing the catalytic role of university incubators in entrepreneurial development. The result suggests that comprehensive incubator facilities encompassing infrastructure, marketing, training, networking, and consultancy

services create an enabling environment that makes entrepreneurship appear more attractive, feasible, and achievable to engineering students.

The substantial influence of incubator facilities on student engagement ($\beta = 0.765$, $p < 0.001$) represents an important finding with practical implications. It demonstrates that well-designed incubator facilities do not merely exist as passive resources but actively capture students' attention, demonstrate value, and motivate utilization intentions. This aligns with recent scholarship on engagement in entrepreneurship education contexts (Koe et al., 2024), suggesting that facilities must be marketed effectively, showcase success stories visibly, and create accessible pathways for participation.

The strong effect of student engagement on entrepreneurial intentions ($\beta = 0.802$, $p < 0.001$) confirms that engagement serves as a powerful proximal predictor of entrepreneurial outcomes. This finding extends Sansone et al.'s (2021) work on engagement in entrepreneurial organizations to the specific context of incubation facilities in engineering education. Students who are aware of available resources, perceive their value, and intend to utilize them develop stronger entrepreneurial intentions, likely through mechanisms including skill acquisition, confidence building, network access, and entrepreneurial identity formation.

Perhaps most significantly, the mediation analysis reveals that student engagement partially mediates the facilities-intentions relationship, accounting for 47.9% of the total effect. This partial mediation pattern indicates that incubator facilities influence entrepreneurial intentions through both direct and indirect pathways. The direct effect suggests that merely knowing about available facilities and perceiving institutional support can enhance intentions. The substantial indirect effect through engagement demonstrates that active student involvement, awareness-building, and perceived value creation serve as crucial transmission mechanisms. This finding contributes to experiential learning theory by empirically demonstrating that facility provision must be coupled with engagement strategies to maximize developmental outcomes.

7.2 Theoretical Implications

This research advances entrepreneurship education literature in several ways. First, it demonstrates the importance of examining mediating mechanisms rather than assuming direct relationships between institutional inputs and individual outcomes. The identification of student engagement as a partial mediator enriches the theoretical understanding of how environmental factors translate into individual intentions. Second, the study extends resource-based theory and experiential learning theory to the specific context of engineering education in an emerging economy, demonstrating their applicability beyond Western contexts. Third, the comprehensive measurement of incubator facilities across five dimensions provides a more nuanced understanding of what constitutes effective incubation support compared to single-indicator measures used in prior research.

7.3 Practical Implications

The findings offer actionable guidance for engineering institutions, incubation center managers, and policymakers. First, institutions should recognize that simply establishing incubator facilities is insufficient; deliberate strategies to enhance student engagement are essential. This requires proactive marketing of services, visible showcasing of success stories, creation of low-barrier entry points for initial engagement, and ongoing communication about available resources. Second, since engagement partially mediates the relationship, institutions should implement engagement-enhancement initiatives including awareness campaigns, experiential events, peer mentor programs, and success celebration ceremonies. Third, the strong influence of engagement on intentions suggests that measuring and monitoring engagement levels can serve as leading indicators of program effectiveness. Fourth, resource allocation decisions should balance investment in tangible facilities with investment in engagement-building activities and personnel.

For policymakers, the findings support continued investment in incubation infrastructure while emphasizing the need for complementary programs that foster engagement. Government initiatives like IIC could incorporate engagement metrics into assessment frameworks alongside facility indicators. For entrepreneurship educators, the results highlight the importance of actively connecting curricular content with available incubator resources, thereby bridging the gap between formal learning and experiential opportunities.

8. Conclusions, Limitations, and Future Research

This study investigated the relationship between business incubator facilities and entrepreneurial intentions among engineering students in Coimbatore district, India, examining the mediating role of student engagement. Using data from 460 students and employing PLS-SEM analysis, the research found strong support for all hypotheses. Incubator facilities significantly influence both student engagement and entrepreneurial intentions directly, while student engagement substantially influences entrepreneurial intentions. Critically, student engagement partially mediates the facilities-intentions relationship, accounting for nearly half of the total effect.

These findings contribute to entrepreneurship education literature by empirically demonstrating that engagement serves as a crucial mechanism through which institutional resources translate into individual entrepreneurial development. The study provides practical guidance for maximizing the return on incubation infrastructure investments through engagement-enhancement strategies.

Several limitations should be acknowledged. First, the cross-sectional design precludes causal inferences; longitudinal research tracking students' engagement trajectories and subsequent entrepreneurial behaviors would strengthen causal claims. Second, the study focused on a specific geographic region (Coimbatore) and discipline (engineering), limiting generalizability to other contexts. Third, the reliance on self-reported measures introduces potential common method bias,

although procedural remedies were employed. Fourth, the study did not examine actual entrepreneurial behavior, only intentions, leaving open questions about the intention-behavior gap.

Future research could address these limitations and extend this work in several directions. Longitudinal designs tracking students from initial facility exposure through engagement development to actual venture creation would provide stronger evidence of causal mechanisms. Comparative studies across different institutional contexts, geographic regions, and educational levels would establish boundary conditions for the observed relationships. Investigation of moderating variables such as entrepreneurial aptitude, prior entrepreneurial exposure, or disciplinary backgrounds could reveal for whom engagement matters most. Finally, qualitative investigations into how students experience engagement transitions from awareness to value perception to utilization could enrich understanding of the engagement process itself.

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