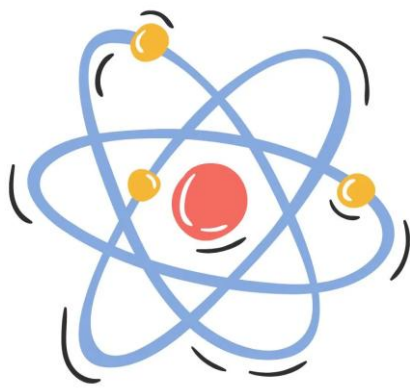




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Abstract: *The heightened significance of entrepreneurship education in higher education has led to an increase in the number of university-based incubators. Such incubators provide students with the necessary infrastructure for starting their own ventures, in addition to mentoring, access to funding, and networking, all of which are processes through which the student entrepreneurial learning experience can be expected to become significantly enriched with capability-building elements. This paper examines the impact of university-based incubators on entrepreneurship education. It is largely a quantitative study. Data were gathered by a structured questionnaire from students of university incubators across India. Regression analysis through SPSS software has been applied to study the relationships between incubation services and entrepreneurship education outcomes. The results indicate a strong positive effect of incubation support on students' entrepreneurial mindset, venture creation intentions, and innovation competencies.*

Keywords: University-Based Incubators; Entrepreneurship Education; Incubation Services; Entrepreneurial Mindset; Venture Creation; Higher Education; Quantitative Analysis.

1. Introduction

Entrepreneurship is seen as the driver of economic growth, innovation, and social change. Universities continuously redefine their missions by including not only teaching and research but also the development of student entrepreneurial skills through entrepreneurship education in their curricula and support systems. One of the important strategic interventions in this process has been the emergence of university-based incubators, which are dynamic infrastructures with the essential components of mentoring, funding linkages, and experiential learning that can help individuals convert their aspirations into start-up realities (Grimaldi & Grandi, 2005; Phan et al., 2005). Entrepreneurship education does not only transfer knowledge about business creation but also attempts to inculcate aspects of an entrepreneurial mindset, which involves opportunity recognition, resilience, and innovation (Fayolle & Gailly, 2008). The more common pedagogical approaches of lectures and case studies have been found wanting in developing these attributes. Incubators can be considered as a form of experiential learning environment that attempt to integrate the two seemingly irreconcilable needs of bridging the gap between theory and practice (Neck & Greene, 2011).

University-based incubators are distinct from corporate or independent incubators in terms of their orientation. The major function of university-based incubators is to develop and harness entrepreneurial competencies with an emphasis on educational success (Etzkowitz, 2003). Students not only develop

startups but also enhance their critical thinking, opportunity evaluation, and risk management skills through direct engagement with entrepreneurial processes.

The significance of incubators in entrepreneurship education is reflected in various global initiatives. For instance, the Massachusetts Institute of Technology (MIT) Martin Trust Center and Stanford University's StartX Accelerator have become benchmarks for integrating incubation and education. In India, initiatives like the Atal Incubation Centres (AICs) at university campuses under the Atal Innovation Mission exemplify how policy-driven incubators contribute to nurturing entrepreneurial education ecosystems.

Despite the rising prominence of university-based incubators, empirical evidence regarding their impact on entrepreneurship education remains limited, especially in emerging economies. Most existing studies focus on business performance outcomes such as venture survival and funding acquisition, rather than educational outcomes like entrepreneurial skills, mindset, and innovation capacity (Bergek & Norrman, 2008).

This gap is particularly important to address because, for universities, the goal extends beyond producing successful startups; it also includes enhancing students' entrepreneurial learning and societal impact potential. Measuring the educational outcomes associated with incubation participation can thus provide valuable feedback for designing more effective entrepreneurship programs. The study aims to:

- Examine the impact of university-based incubation services (mentorship, infrastructure, funding, training) on students' entrepreneurial education outcomes.
- Assess which specific incubation services have the most significant influence on entrepreneurship education metrics.
- Provide recommendations to universities for enhancing their incubation models to better support entrepreneurial learning.

2. Literature Review

2.1 Entrepreneurship Education: Foundations and Objectives

Entrepreneurship education has evolved as a distinct field aimed at developing entrepreneurial competencies such as opportunity recognition, innovation, risk management, and venture creation skills (Fayolle & Gailly, 2008). The primary objective is not solely to create entrepreneurs but also to instill entrepreneurial thinking among students across disciplines (Gibb, 2002). Research underscores that entrepreneurship education positively impacts entrepreneurial intentions, self-efficacy, and venture creation behaviour (Martin, McNally, & Kay, 2013).

Experiential learning theories, particularly Kolb's Experiential Learning Cycle (1984), have influenced entrepreneurship pedagogy, emphasizing active engagement, reflection, conceptualization, and experimentation. Universities globally have incorporated practical elements like business plan competitions, startup internships, and venture simulation games to foster hands-on learning (Neck & Greene, 2011).

2.2 University-Based Incubators: Concept and Function

University-based incubators are organizational units within academic institutions that provide structured support to nascent entrepreneurs, including infrastructure (workspace, internet), mentorship, seed funding access, business services, and market linkages (Grimaldi & Grandi, 2005; Mian, 1996). Unlike purely commercial incubators, university incubators emphasize educational, societal, and regional development outcomes (Etzkowitz, 2003).

The triple helix model (Etzkowitz & Leydesdorff, 2000) highlights how university–industry–government interactions foster innovation ecosystems, with university incubators playing a central role. They bridge academic knowledge creation and market application by supporting students and researchers in venture creation. Research by Hackett and Dils (2004) categorizes incubators' value-added contributions into areas such as access to capital, operational assistance, strategic guidance, and psychological support.

2.3 Impact of University-Based Incubators on Entrepreneurship Education

Multiple studies suggest that university incubators positively influence entrepreneurship education outcomes:

- **Skill Development:** Incubators enhance opportunity identification, business model innovation, financial planning, and networking skills (Bergek & Norrman, 2008).
- **Entrepreneurial Intention:** Students participating in incubation programs exhibit higher entrepreneurial intention levels compared to non-participants (Souitaris, Zerbini, & Al-Laham, 2007).
- **Innovation Competency:** Exposure to real startup creation processes within incubators boosts students' innovation capabilities (Rothaermel & Thursby, 2005).

However, not all studies report universally positive effects. Some note that insufficient mentorship quality, misalignment between academic curricula and incubation activities, and lack of structured evaluation mechanisms may limit the benefits (Lewis, Harper-Anderson, & Molnar, 2011).

2.4 Key Services Provided by University-Based Incubators

The literature identifies the following core services provided by incubators in Table 1 to support entrepreneurial education (Grimaldi & Grandi, 2005; Schwartz, 2013):

Table 1. Services Provided by Incubators

Service	Educational Contribution
Infrastructure Support	Provides a professional environment conducive to innovation and collaboration.
Mentorship	Offers expert guidance in business planning, strategy, operations, and leadership development.
Financial Access	Links students to seed funding, angel investors, and venture capital opportunities.

Networking Opportunities	Facilitates industry connections, partnerships, and market exposure.
Workshops and Seminars	Enhances entrepreneurial competencies through structured training programs.

These services collectively create an experiential learning environment that aligns with Kolb's (1984) model, allowing students to apply theoretical concepts in real entrepreneurial settings.

2.5 Entrepreneurship Education Outcomes

Commonly measured outcomes of entrepreneurship education influenced by incubators include:

- **Entrepreneurial Mindset:** Development of proactive, opportunity-focused thinking (Krueger, 2000).
- **Venture Creation Intention:** Increased likelihood of students starting a business (Fayolle & Liñán, 2014).
- **Innovation Capacity:** Enhanced ability to develop novel products, services, and processes (Pittaway & Cope, 2007).
- **Risk Management Skills:** Improved capability to assess and mitigate entrepreneurial risks.

Souitaris et al. (2007) found that experiential components of entrepreneurship education, such as business incubation, had a stronger effect on entrepreneurial attitudes compared to traditional classroom teaching.

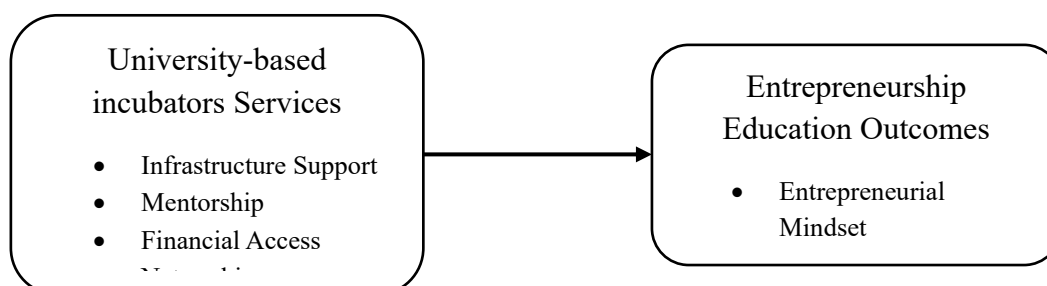
2.6 Research Gaps

Despite growing interest, key research gaps persist. Most studies emphasize venture success and economic outcomes, neglecting educational impacts like mindset shifts and innovation skills (Bergek & Norrman, 2008). Rigorous quantitative analysis, such as regression methods, remains scarce for evaluating the link between incubation and entrepreneurship education (Hackett & Dilts, 2004). Additionally, research on university incubators' educational influence in emerging economies like India is limited (Wasdani & Mathew, 2014). Comparative studies between incubator-exposed students and those in traditional entrepreneurship programs are also lacking, leaving important questions about the relative effectiveness of different educational models unanswered.

2.7 Conceptual Framework for the Study

Based on the reviewed literature, the following conceptual framework underpins this study:

Figure 1. Conceptual Framework



The study hypothesizes that university-based incubation services significantly and positively influence entrepreneurship education outcomes among students. Research Hypotheses:

- H_0 : University-based incubators have no significant impact on entrepreneurship education outcomes among students.
- H_1 : University-based incubators have a significant positive impact on entrepreneurship education outcomes among students.

3. Research Methodology

This study adopts a structured quantitative research design to rigorously examine the impact of university-based incubation services on entrepreneurship education outcomes, utilizing advanced statistical techniques via SPSS software (Creswell & Creswell, 2017). A cross-sectional survey strategy was implemented, capturing data at a single point in time from students engaged with incubation programs at universities across India. The investigation was guided by the hypothesis that participation in such programs significantly influences entrepreneurship education outcomes. The target population consisted of students affiliated with institutions hosting formal incubation centers, including Atal Incubation Centres, Entrepreneurship Development Cells, and Technology Business Incubators. Employing a purposive sampling approach ensured the selection of respondents with direct incubation experience. Of the 250 students solicited, 217 valid responses were obtained, thereby meeting the recommended standards for achieving sufficient statistical power in regression analysis. Data collection was conducted through a structured online questionnaire between July to September 2024, comprising sections on demographic variables, engagement with incubation services (measured on 5-point Likert scales), and entrepreneurship education outcomes encompassing entrepreneurial mindset, venture creation intention, and innovation capacity. The analytical procedure entailed the computation of descriptive statistics to summarize sample characteristics and hypothesis testing through multiple regression analysis. Model adequacy was evaluated using R^2 , Adjusted R^2 , and ANOVA F-statistics, and inferential strength was assessed via regression coefficients.

4. Data Analysis and Results

4.1 Descriptive Statistics

Descriptive statistics were conducted to summarize the characteristics of the sample and the variables under study.

Table 2. Descriptive statistics

Variable	N	Mean	Standard Deviation
Infrastructure Support	217	4.12	0.68
Mentorship Support	217	4.08	0.72
Financial Access	217	3.95	0.76

Networking Opportunities	217	4.01	0.69
Training Workshops	217	4.15	0.66
Entrepreneurship Education Outcomes	217	4.22	0.61

The Table 2. show that students rated Training Workshops ($M = 4.15$) and Infrastructure Support ($M = 4.12$) as the most influential incubation services, followed closely by Mentorship Support ($M = 4.08$). Networking Opportunities ($M = 4.01$) were moderately valued, while Financial Access ($M = 3.95$) was rated comparatively lower. The highest mean was observed for Entrepreneurship Education Outcomes ($M = 4.22$), suggesting that overall, students perceived strong educational benefits from incubation participation. Low standard deviations across variables indicate relatively consistent responses among participants.

Regression Analysis

Table 3. Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.756 ^a	0.571	0.561	0.401
a. Predictors: (Constant), Infrastructure Support, Mentorship, Financial Access, Networking Opportunities and Training Workshops				

The model summary in Table 3 shows a strong positive relationship ($R = 0.756$) between incubation services and entrepreneurship education outcomes. Approximately **57.1%** of the variance in outcomes is explained by the predictors ($R^2 = 0.571$), with an Adjusted R^2 of 0.561 confirming model reliability. Overall, these results demonstrate that incubation services have a substantial impact on shaping entrepreneurship education outcomes among students.

Table 4. ANOVA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	68.214	5	13.643	84.768	0.000 ^b
	Residual	51.183	211	0.242		
	Total	119.397	216			
a. Dependent Variable: Entrepreneurship Education Outcomes						
b. Predictors: (Constant), Infrastructure Support, Mentorship, Financial Access, Networking Opportunities and Training Workshops						

The ANOVA results in Table 4 show that the regression model is statistically significant ($F = 84.768$, $p < 0.001$). This indicates that the predictors — Infrastructure Support, Mentorship Support, Financial Access, Networking Opportunities, and Training Workshops — together have a significant impact on Entrepreneurship Education Outcomes. The model explains a considerable proportion of variance, confirming its validity and relevance for further analysis.

Table 5. Regression Coefficient

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.211	0.318		3.807	0.000
	Infrastructure Support	0.186	0.062	0.175	2.998	0.003
	Mentorship Support	0.224	0.067	0.214	3.343	0.001
	Financial Access	0.107	0.055	0.097	1.945	0.053
	Networking Opportunities	0.134	0.061	0.128	2.197	0.029
	Training Workshops	0.279	0.064	0.265	4.359	0.000
a. Dependent Variable: Entrepreneurship Education Outcomes						

The regression coefficients analysis in Table 5 shows that Training Workshops ($\beta = 0.265$, $p < 0.001$) and Mentorship Support ($\beta = 0.214$, $p < 0.01$) are the most significant predictors of entrepreneurship education outcomes. Infrastructure Support ($\beta = 0.175$, $p < 0.01$) and Networking Opportunities ($\beta = 0.128$, $p < 0.05$) also positively influence outcomes. Financial Access was marginally significant ($p = 0.053$), indicating a weaker impact compared to experiential factors. Overall, University-based incubators have a significant positive impact on entrepreneurship education outcomes among students. The results highlight that component, such as training and mentorship, along with supportive infrastructure and networking, play a critical role in shaping entrepreneurial competencies among university students, while financial access has a comparatively weaker but still relevant role during the education phase.

5. Discussion and Implication

The purpose of this study was to examine the impact of university-based incubation services on entrepreneurship education outcomes among students. The regression analysis results provide compelling evidence that incubation services significantly enhance students' entrepreneurial mindset, innovation capacities, and venture creation intentions. The findings of this study reveal that training workshops, mentorship support, and infrastructure support are the most significant predictors of entrepreneurship education outcomes among students. Training workshops emerged as the strongest

influence, aligning with previous studies that emphasize the importance of experiential learning interventions in developing entrepreneurial competencies (Fayolle & Gailly, 2008; Neck & Greene, 2011). Mentorship support also demonstrated a strong positive impact, consistent with the literature highlighting mentorship's role in fostering strategic decision-making and resilience (Grimaldi & Grandi, 2005; Schwartz, 2013). Infrastructure support significantly contributed by providing a conducive environment for innovation (Hackett & Dilts, 2004). Networking opportunities showed a moderate influence, affirming that access to business networks enhances entrepreneurial validation and resource acquisition (Rothaermel & Thursby, 2005). Financial access was only marginally significant, suggesting that during the educational phase, mentorship and skill-building are more critical than funding. These findings align broadly with prior research (Souitaris et al., 2007; Etzkowitz, 2003) but differ from startup-focused studies where funding is a primary driver (Bergek & Norrman, 2008). Theoretically, this study expands entrepreneurship education literature by validating that incubation services within universities not only foster startup success but crucially shape entrepreneurial mindsets, skills, and innovation capacities. Practically, university administrators and incubator managers should prioritize investment in mentorship programs, experiential workshops, and vibrant learning infrastructures to enhance educational outcomes, while also strengthening networking initiatives to bridge academic learning with real-world entrepreneurial ecosystems.

6. Conclusion

This study quantitatively assessed the impact of university-based incubation services on entrepreneurship education outcomes among students. The findings demonstrate that training workshops, mentorship support, and infrastructure availability significantly enhance students' entrepreneurial mindsets, innovation abilities, and intentions to pursue venture creation. The regression analysis indicated that incubation services explained a substantial proportion of the variance in educational outcomes, with training workshops exerting the greatest influence. These results empirically confirm that university incubators are not merely venture-support mechanisms but are essential educational environments contributing to the development of future entrepreneurs. The study thus contributes to the broader entrepreneurship and innovation literature by integrating educational impacts into incubation effectiveness models and offering robust empirical support for the role of experiential learning within academic incubation settings. Practical implications suggest that universities should design incubation programs that go beyond infrastructure provision to foster rich mentorship ecosystems, offer comprehensive training interventions, and create dynamic networking platforms that connect students with industry, investors, and entrepreneurial alumni. These strategic efforts could significantly strengthen the entrepreneurial capacities of university students.

7. Limitation

Despite the valuable insights offered, this study is subject to certain limitations. The use of a cross-sectional research design restricts the ability to infer causality between incubation services and educational outcomes. The use of purposive sampling, which is confined to students who have involved themselves in the incubation process, may carry some element of choice bias and thus the results cannot be applied to students at large. Much of the variation in evolving the entrepreneurial competencies of the students can be addressed by taking different approaches in further studies toward discovering that fact. Comparative studies using quasi-experimental designs could provide a deeper insight by looking at the difference between student cohorts who were exposed and not exposed to the incubation process.

Further exploration of the effects of incubation on different categories of colleges, such as technical colleges, business colleges, and liberal arts colleges could reveal important contextual differences and provide a better understanding of how varying academic settings influence the outcomes of entrepreneurship education.

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