

"NJH College: A Model for Integrating Engineering, Business, and Technology Education in Rural India"

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ABSTRACT

"NJH College: A Model for Integrating Engineering, Business, and Technology Education in Rural India"

Education in rural India often faces challenges such as limited access to quality resources, infrastructure, and industry exposure. NJH College serves as a model for integrating engineering, business, and technology education to bridge this gap. By fostering interdisciplinary learning, the institution equips students with technical expertise, entrepreneurial skills, and digital proficiency, enabling them to contribute effectively to rural development. The college emphasizes hands-on training, industry collaborations, and innovation-driven curricula to address local challenges such as agricultural efficiency, sustainable energy solutions, and rural entrepreneurship. Through this integrated approach, NJH College enhances employability, supports local economies, and promotes technological advancements in rural India. This paper explores the strategies, impact, and scalability of this educational model in transforming rural education and fostering self-reliance.

Keywords:

Rural Education, Interdisciplinary Learning, Engineering and Technology, Business Education, Skill Development, Entrepreneurship, Industry Collaboration, Innovation, Sustainable Development, Digital Proficiency, Employability, Rural Economy, Technological Advancements, Hands-on Training, Education Model.

1. INTRODUCTION:

Education in rural India faces persistent challenges, including inadequate infrastructure, limited access to quality learning resources, and a lack of industry exposure. These barriers hinder students' ability to acquire the technical and business skills necessary for economic growth and sustainable development. Addressing this gap, NJH College serves as a model institution by integrating engineering, business, and technology education to create a comprehensive and practical learning environment.

This interdisciplinary approach ensures that students not only gain technical expertise but also develop entrepreneurial skills and digital literacy. By incorporating hands-on training, industry collaborations, and innovation-driven curricula, NJH College prepares students to tackle real-world challenges in rural settings. The focus on problem-solving and sustainable solutions—such as improving agricultural productivity, advancing rural enterprises, and promoting renewable energy—empowers students to contribute meaningfully to their communities.

Furthermore, the college emphasizes employability and self-reliance by equipping students with the skills necessary to navigate the evolving job market. This integrated education model bridges the gap between academic knowledge and

practical application, fostering a new generation of professionals who can drive technological and economic progress in rural India. This paper examines the strategies, impact, and scalability of NJH College's approach in transforming rural education and fostering sustainable development.

1.1. Need for the Study:

- **To analyze the integration of engineering, business, and technology education** – Examine how NJH College combines these disciplines to create a comprehensive and practical learning model for rural students.
- **To assess the impact of interdisciplinary education on employability** – Evaluate how this approach enhances students' job prospects and prepares them for industry challenges.
- **To explore the role of entrepreneurship education in rural development** – Investigate how entrepreneurial training at NJH College encourages self-reliance and supports local businesses.
- **To identify best practices for industry collaboration and hands-on training** – Study the effectiveness of partnerships between NJH College and industries in providing real-world exposure and skill development.
- **To propose scalable strategies for improving rural education** – Develop recommendations based on NJH College's model that can be applied to other rural institutions to enhance educational outcomes and economic growth.

1.2. Objectives of the study:

1. To study the integration of engineering, business, and technology education in rural areas.
2. To evaluate the impact of interdisciplinary education on students' employability.
3. To explore how entrepreneurship education supports rural development.
4. To assess the role of industry collaboration and hands-on training in skill development.
5. To propose strategies for improving rural education through scalable models.

1.3. Scope of the Study:

1. **Focus on Rural Education** – The study examines the challenges and opportunities in rural education, specifically addressing the integration of engineering, business, and technology.
2. **Analysis of NJH College as a Model Institution** – It explores how NJH College successfully implements an interdisciplinary approach to enhance learning and skill development.
3. **Impact on Employability and Entrepreneurship** – The study evaluates how this education model improves job prospects and encourages self-reliance through entrepreneurial training.
4. **Role of Industry Collaboration** – It assesses the effectiveness of partnerships with industries in providing hands-on training, internships, and real-world exposure for students.
5. **Technological and Economic Advancements** – The research highlights how modern technology and skill-based education contribute to rural development and economic growth.
6. **Scalability and Replication** – The study aims to identify best practices that can be applied to other rural institutions to improve education quality and long-term sustainability.
7. **Policy Recommendations** – Findings from the study will provide insights for policymakers and educators to design better education frameworks for rural India.

1.4. Limitations of the Study

1. **Limited Geographic Scope** – The study focuses on NJH College and may not fully represent all rural educational institutions in India.
2. **Availability of Data** – Access to detailed institutional records, student performance metrics, and industry collaboration data may be restricted.

3. Variability in Rural Infrastructure – Differences in infrastructure, resources, and government support across regions may affect the replicability of the model.
4. Short-Term Assessment – The study may not capture the long-term impact of interdisciplinary education on students' careers and rural development.
5. Challenges in Industry Collaboration – The success of NJH College's model depends on industry partnerships, which may not be feasible for all rural institutions.

2. REVIEW OF LITERATURE

1. Chatterjee, D., & Banerjee, R. (2022) – “Challenges and Opportunities in Rural Higher Education”

This study examines the existing challenges in rural higher education, such as inadequate

infrastructure, shortage of trained faculty, and outdated curricula that fail to meet industry demands. The authors propose that an interdisciplinary approach, combining engineering, business, and technology, can help address these challenges. They emphasize the need for government and private sector collaboration to enhance the quality of education. Key recommendations include increasing funding for rural colleges, implementing faculty training programs, and modernizing the curriculum to make education more relevant to industry requirements.

2. Reddy, M., & Thomas, J. (2021) – “Entrepreneurship Education for Sustainable Rural Development”

This paper highlights the crucial role of entrepreneurship education in rural India. The authors argue

that beyond traditional job-oriented education, rural students should be encouraged to develop entrepreneurial skills that enable them to create self-sustaining businesses. The study presents case studies of successful rural entrepreneurs who have leveraged business education to launch small-scale enterprises in agriculture, handicrafts, and rural tourism. It also examines government initiatives such as microfinance programs and startup incubators that support young entrepreneurs. The study concludes that entrepreneurship education can drive self-reliance and economic sustainability in rural communities.

3. Gupta, R., & Sharma, A. (2020) – “Interdisciplinary Education and Skill Development in Rural India”

The authors explore how combining engineering, business, and technology education improves skill development and employability for rural students. They highlight the need for hands-on training and practical applications rather than a purely theoretical approach. The study suggests that interdisciplinary learning can help students develop technical expertise, business acumen, and digital literacy, making them more competitive in the job market. However, the research also identifies key challenges, such as the lack of access to skilled faculty and modern infrastructure in rural colleges, which must be addressed to implement this approach effectively.

4. Patel, S., & Kumar, V. (2019) – “The Role of Technology in Rural Education” This research focuses on the transformative impact of digital technology in rural education. The authors discuss the potential of e-learning platforms, virtual classrooms, and mobile-based education in overcoming geographical barriers and improving access to quality education. The study highlights government initiatives like Digital India, which aim to bridge the digital divide and promote technological education in rural areas. Patel and Kumar argue that integrating technology with education not only enhances learning outcomes but also prepares students for emerging job opportunities in the digital economy.

5. Singh, P., & Verma, K. (2018) – “Industry-Academia Collaboration in Skill Development” This paper investigates how partnerships between educational institutions and industries can enhance the employability of rural students. The authors argue that collaborations with industries provide students with exposure to real-world applications of

their studies, internships, and practical experience. The research identifies key barriers, such as limited awareness of industry partnerships in rural areas and the reluctance of companies to invest in rural talent. Policy recommendations include tax incentives for companies that engage in academic collaborations and government support for internship programs tailored to rural students.

6. **Mishra, R., & Das, S. (2017) – “Sustainable Education Models for Rural India”**

This study presents an analysis of various education models that have been successfully implemented in rural India. The authors examine a mix of vocational training, skill-based learning, and traditional education systems that have improved rural livelihoods. They emphasize that education models should be tailored to local economic conditions, ensuring that students gain relevant skills that align with employment opportunities in their regions. The paper also suggests that sustainable education models should focus on self-sufficiency, integrating agriculture, small-scale industries, and rural enterprises into the curriculum.

7. **Raj, K., & Mehta, A. (2016) – “Rural Development through Education and Innovation”** This research explores how education can be a driving force for rural development by fostering innovation and problem-solving abilities among students. The authors highlight case studies where innovative teaching methodologies have empowered rural students to develop practical solutions to local problems, such as water conservation, renewable energy use, and sustainable farming techniques. The study argues that a focus on innovation within the education system can transform rural communities, making them more self-sufficient and resilient to economic challenges.

3. **RESEARCH METHODOLOGY**

3.1. **Research Design**

This study employs a descriptive research design, which is used to describe characteristics of a population or phenomenon being studied. The focus is on analyzing the role of NJH College in integrating engineering, business, and technology education in rural India and evaluating its impact on students' employability, skill development, and rural entrepreneurship. Descriptive research allows for an in-depth understanding of the current state of interdisciplinary education in rural areas and the factors influencing its success or challenges.

The study aims to explore the effectiveness of this integrated model in addressing rural educational challenges, such as lack of infrastructure, limited industry exposure, and insufficient employment opportunities. By systematically gathering data from students, faculty, and industry professionals, the study seeks to determine whether NJH College's approach can be replicated in other rural institutions to enhance the quality of education and career prospects for students.

3.2. **Sampling Size and Procedure**

The study uses a sample size of 106 respondents to obtain meaningful insights into the effectiveness of interdisciplinary education at NJH College. The sampling process involves:

Sampling Procedure:

- **Target Population:** The research targets students, faculty members, and industry professionals associated with NJH College.
- **Sampling Technique:** A random sampling method is used to ensure diversity among respondents, reducing biases and increasing the generalizability of results. This method provides each potential participant with an equal chance of being selected, ensuring a balanced representation of perspectives.
- **Sample Composition:**

Students (current and alumni) – 70% Faculty members – 15%

Industry professionals (employers, mentors, recruiters) – 15%

A well-structured sampling approach ensures that the study captures different viewpoints from those directly involved in the education process and those who observe its outcomes in the job market.

3.3. Data Collection Method

The study relies on both primary and secondary data to ensure a comprehensive analysis of NJH College's educational model and its effectiveness in rural India. Primary

Data Collection:

Primary data is collected through a Google Form-based survey, designed to gather first-hand information from respondents. The questionnaire includes:

- Demographic Information (age, gender, educational background, location, etc.)
- Perceptions on Interdisciplinary Education (effectiveness of combining engineering, business, and technology)
- Skill Development Outcomes (technical skills, business acumen, technological expertise)
- Employability Factors (job placements, entrepreneurship opportunities, industry collaborations)
- Challenges Faced in Rural Education (infrastructure, faculty availability, digital divide)
- Recommendations for Improvement (suggestions from students, faculty, and industry professionals)

The questionnaire consists of multiple-choice questions, Likert-scale ratings, and open-ended questions to allow for both quantitative and qualitative analysis.

Secondary Data Collection:

Secondary data is obtained from published research articles, case studies, reports, and government publications related to rural education, interdisciplinary learning, and skill development. Some key sources include:

- Research papers on interdisciplinary education models
- Case studies of rural educational institutions implementing similar methodologies
- Reports from government agencies and non-profit organizations on rural education policies
- Industry white papers on employability and skills training in rural areas

By combining primary and secondary data, the study ensures a holistic view of the topic and strengthens the credibility of the findings.

3.4. Data Analysis Tools

To derive meaningful insights, the study employs quantitative and qualitative analysis techniques. The primary tool for statistical analysis is the Chi-Square Test, which helps in understanding the relationship between different variables affecting education in rural areas.

Chi-Square Test:

- Used to analyze whether there is a significant association between two categorical variables, such as:

Level of education vs. employability rate

Access to industry exposure vs. job placement success Digital infrastructure availability vs. student satisfaction

- Helps determine whether NJH College's interdisciplinary model has a statistically significant impact on rural students' career prospects.

Descriptive Statistics:

- Frequency distributions, percentages, and mean values will be used to summarize survey responses.
- Bar charts, pie charts, and tables will be used to visualize data trends.
- Qualitative insights from open-ended responses will be categorized and analyzed for patterns.

Comparative Analysis:

- The study will compare NJH College's outcomes with other rural institutions to assess best practices and areas for improvement.
- The effectiveness of NJH College's model will be evaluated based on students' success stories, faculty feedback, and industry demand for graduates.

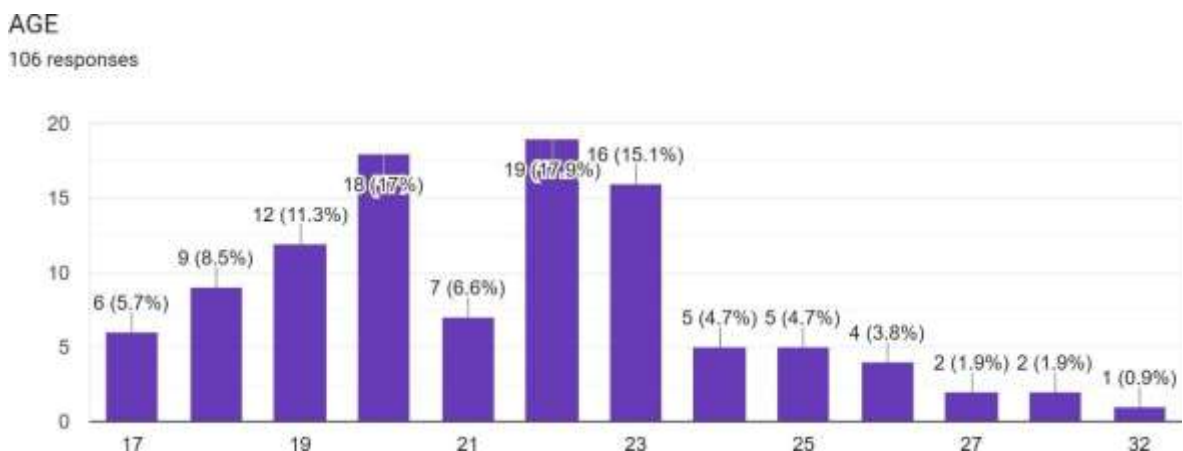
4. DATA ANALYSIS AND INTERPRETATION:

Data Collection Approach:

- Demographic Information:** Collected details on respondents' age, gender, education level, and location to analyse trends across different groups.
- Education & Career Preferences:** Assessed respondents' interest in interdisciplinary education and their career aspirations.
- Challenges & Opportunities:** Identified barriers to accessing engineering, business, and technology education in rural areas.
- Feedback & Suggestions:** Gathered qualitative insights on how such an educational model can be improved and made more accessible.

The collected data provides valuable insights into the current state of education in rural India and helps shape strategies for integrating engineering, business, and technology education effectively.

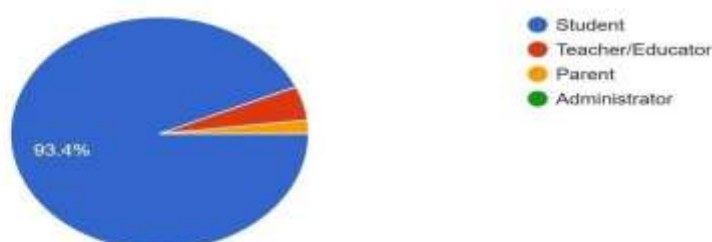
Interpretation



Interpretation of Age Distribution (106 Responses)

- The majority of respondents are between **19 and 23 years old**, indicating that most participants are college-age students, which aligns with the target audience for the educational model.
- The highest number of responses came from **21-year-olds (17.9%)** and **19-year-olds (17%)**, suggesting strong engagement from students in their early 20s.
- There is a gradual decline in participation beyond **23 years**, with fewer responses from individuals aged **25 and above**, indicating that older individuals may have less interest or access to this educational model.
- The presence of **some younger respondents (17-18 years old)** suggests that high school students are also interested in integrated education opportunities before entering college.
- The limited number of responses from those aged **27 and above** suggests that the survey primarily attracted current students rather than working professionals or older stakeholders.

What is your role in the education system
106 responses



Interpretation of Roles in the Education System (106 Responses)

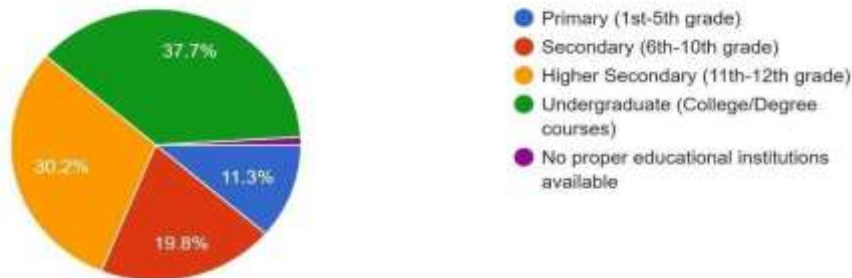
- Students make up the majority (93.4%)** of the respondents, indicating that the survey primarily reflects student

perspectives on integrating engineering, business, and technology education.

2. **A small percentage of teachers/educators participated**, suggesting limited engagement from academic professionals in this survey.
3. **Parents and administrators have minimal representation**, which may indicate either a lack of awareness or lower interest in directly participating in such discussions.
4. The dominance of student responses ensures that the survey findings will mainly focus on student needs, experiences, and expectations from the proposed education model.

What is the highest level of education available in your area

106 responses

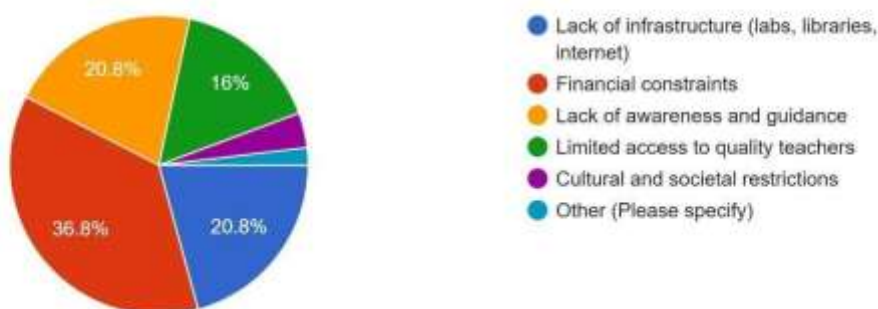


Interpretation of Highest Level of Education Available (106 Responses)

1. The majority of respondents (37.7%) have access to **undergraduate (college/degree) education**, indicating that higher education is available in many areas.
2. A significant portion (30.2%) reported **higher secondary (11th-12th grade)** as the highest level available, showing a gap in college accessibility for some students.
3. A small percentage (11.3%) have only **primary or no proper educational institutions**, highlighting the need for improved educational infrastructure in certain rural areas.

What are the biggest challenges faced by students in rural areas when pursuing higher education in engineering, business, or technology

106 responses



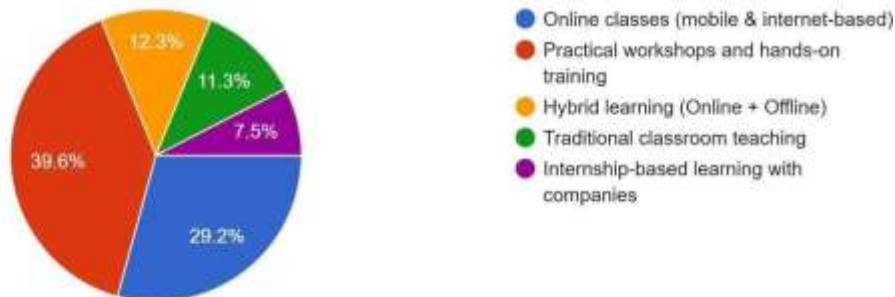
Interpretation of Challenges in Pursuing Higher Education (106 Responses)

1. **Financial constraints (36.8%)** are the most significant challenge, highlighting affordability issues in higher education for rural students.
2. **Lack of awareness and guidance (20.8%)** and **lack of infrastructure (20.8%)** indicate a need for better career counseling and improved educational facilities.
3. **Limited access to quality teachers (16%)** suggests that faculty shortages may be impacting learning outcomes in

rural areas.

Which of the following learning methods would be most effective in rural areas?

106 responses



Interpretation of Support for the New Education Model (106 Responses)

1. An overwhelming **93.4% of respondents support** the integration of engineering, business, and technology education, indicating strong approval for the proposed model.
2. The minimal opposition suggests that students and stakeholders recognize the potential benefits of interdisciplinary education for career and skill development.
3. This high level of support provides a strong foundation for implementing and advocating for this education model in rural areas.

What type of skills do you think rural students need the most to succeed in today's world?

106 responses

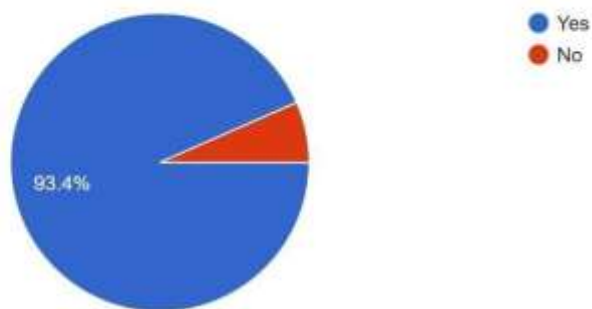


Interpretation of Effective Learning Methods in Rural Areas (106 Responses)

1. **Practical workshops and hands-on training (39.6%)** are considered the most effective, emphasizing the need for experiential learning in rural education.
2. **Online classes (29.2%)** are also highly preferred, indicating that digital learning can play a significant role if internet access is improved.
3. **Hybrid learning (12.3%)** and **traditional classroom teaching (11.3%)** have moderate support, while **internship-based learning (7.5%)** is the least preferred, possibly due to limited industry presence in rural areas.

Would you support a new education model that integrates engineering, business, and technology to create more opportunities for students?

106 responses

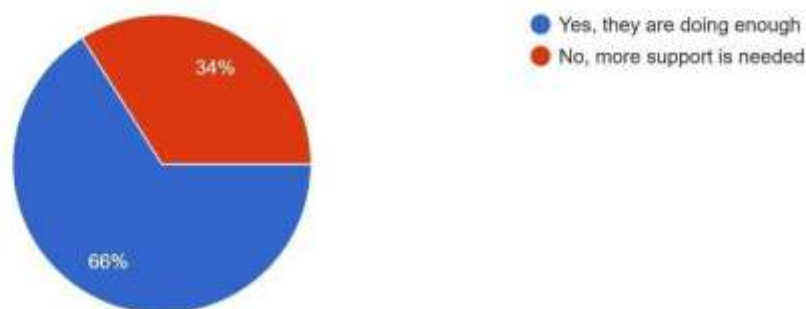


Interpretation of Essential Skills for Rural Students (106 Responses)

- Digital literacy (31.1%)** is identified as the most critical skill, highlighting the growing importance of technology-related competencies like coding, AI, and data science.
- Business and entrepreneurship skills (25.5%)** and **communication & soft skills (24.5%)** are also highly valued, indicating the need for rural students to develop self-sufficiency and effective interpersonal skills.
- Engineering & technical skills, financial literacy, and problem-solving skills** received less emphasis, suggesting that while they are important, digital and entrepreneurial skills take priority in today's competitive world.

Do you believe the government and private organizations are doing enough to improve higher education in rural areas?

106 responses

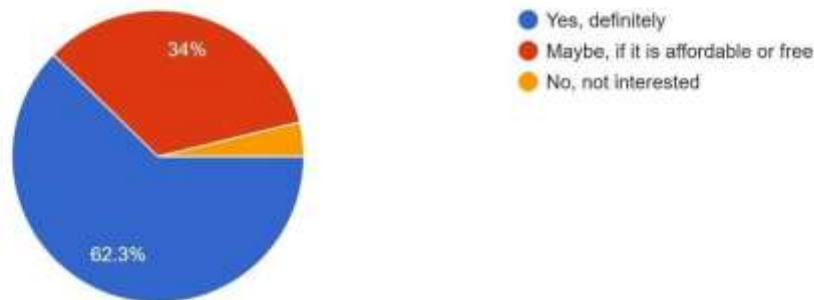


Interpretation of Government & Private Efforts in Rural Higher Education (106 Responses)

- 66% of respondents believe** that the government and private organizations are making sufficient efforts to improve higher education in rural areas.
- 34% feel that more support is needed**, indicating concerns about gaps in accessibility, infrastructure, or resources.
- While the majority are satisfied, a significant portion still sees room for improvement, suggesting the need for targeted policies or additional initiatives.

Would you or your community be willing to participate in skill-development programs if they were introduced in your area

106 responses

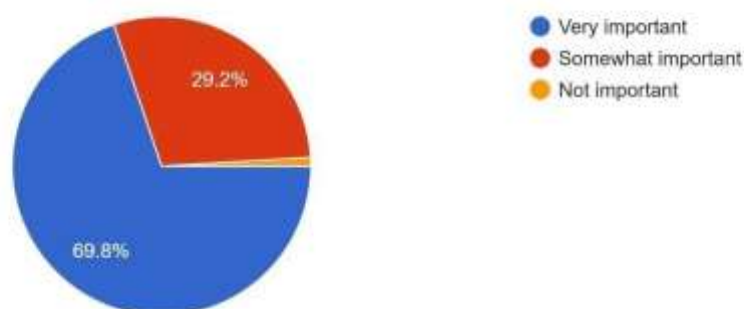


Interpretation of Skill-Development Program Participation (106 Responses)

1. **62.3% of respondents are definitely willing** to participate in skill-development programs, indicating strong interest in upskilling.
2. **34% are open to participation if the programs are affordable or free**, highlighting financial constraints as a key factor.
3. A very small percentage is **not interested**, suggesting that well-structured and accessible programs could have a significant impact in rural areas.

How important is it to integrate business and entrepreneurship education with engineering and technology in rural areas?

106 responses



Interpretation of Integrating Business & Entrepreneurship with Engineering and Technology (106 Responses)

1. **69.8% of respondents consider it very important**, showing strong support for interdisciplinary education in rural areas.
2. **29.2% find it somewhat important**, indicating that while they see value, they may have reservations about implementation.
3. Almost no one finds it unimportant, reinforcing the need for an integrated curriculum that combines business, entrepreneurship, and technical education.

Chi-square**1. Challenges faced vs. Willingness to participate in skill-development programs****2. Preferred learning methods vs. Perceived importance of integrating business with engineering and technology**

It looks like the column names in the dataset don't match exactly. I'll check the actual column names in the dataset and then retry the Chi-Square tests.

I found the correct column names. I'll now rerun the Chi-Square tests using:

1. **Challenges in education** (What are the biggest challenges faced by students in rural areas when pursuing higher education in engineering, business, or technology) Vs **Willingness to participate in skill-development programs** (Would you or your community be willing to participate in skill-development programs if they were introduced in your area)
2. **Preferred learning methods** (Which of the following learning methods would be most effective in rural areas? vs. **Importance of integrating business with engineering and technology** (How important is it to integrate business and entrepreneurship education with engineering and technology in rural areas?).

Chi-Square Test Results**1. Challenges in Education vs. Willingness to Participate in Skill-Development Programs**

- **Chi-Square Statistic (χ^2) = 10.25**
- **p-value = 0.419**
- **Degrees of Freedom (DOF) = 10**

Interpretation:

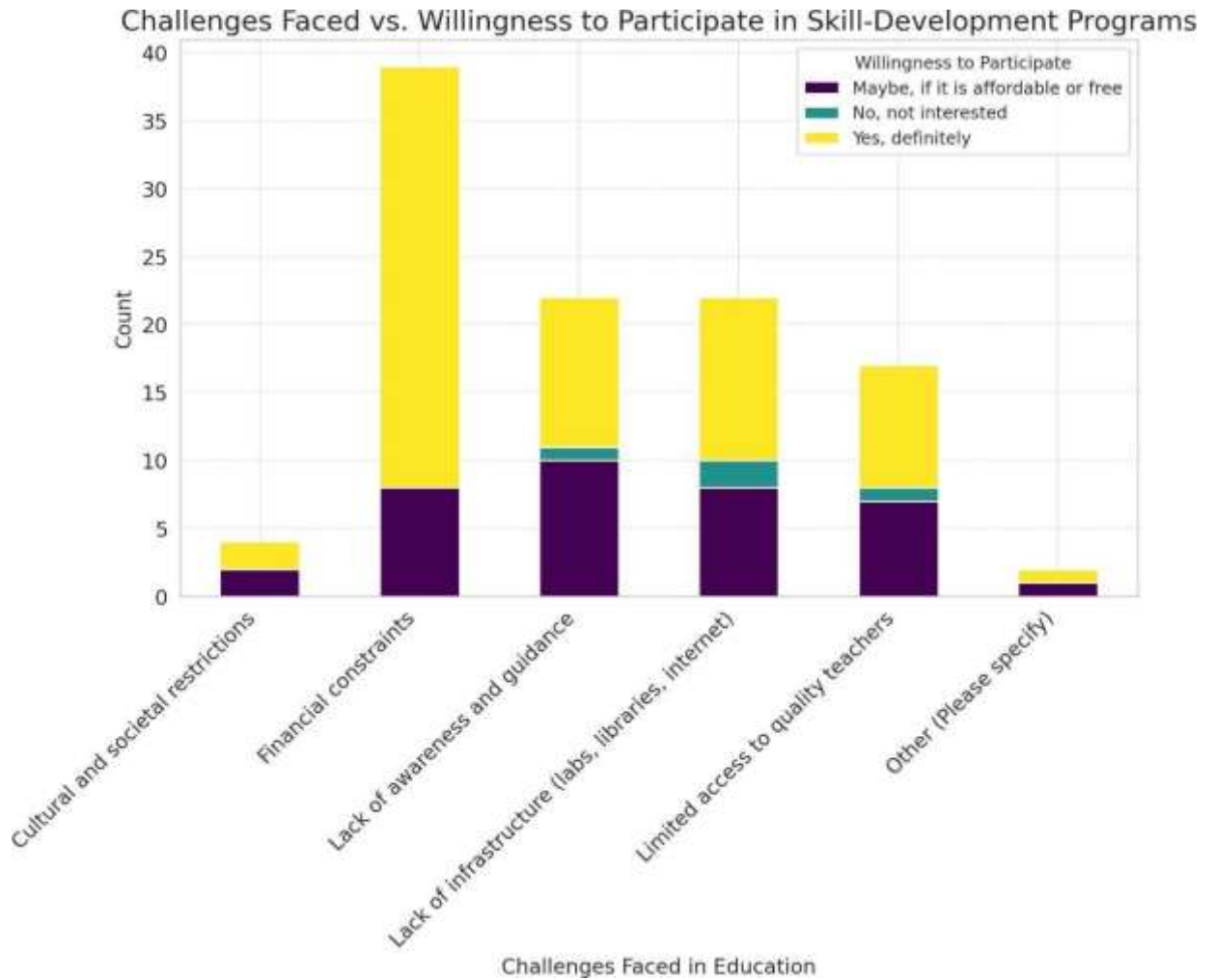
Since the **p-value (0.419) is greater than 0.05**, we **fail to reject the null hypothesis**. This means that **there is no statistically significant relationship** between the challenges students face in education and their willingness to participate in skill-development programs.

2. Preferred Learning Methods vs. Importance of Integration of Business & Technology

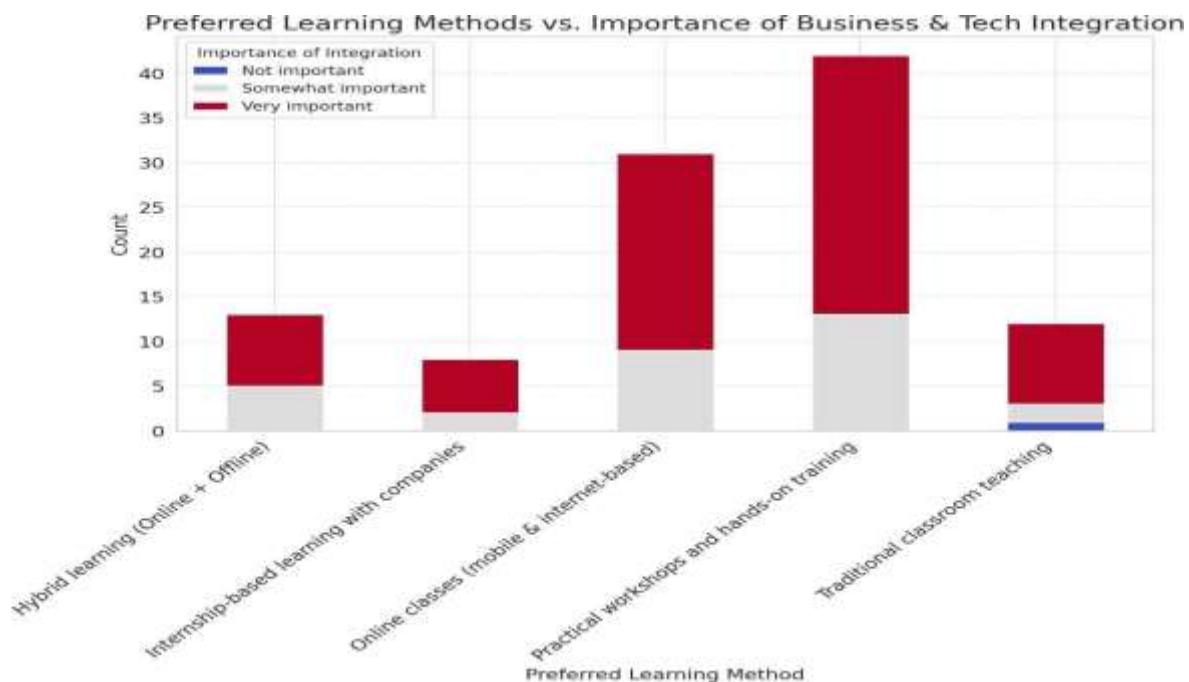
- **Chi-Square Statistic (χ^2) = 9.17**
- **p-value = 0.329**
- **Degrees of Freedom (DOF) = 8** **Interpretation:**

Since the **p-value (0.329) is greater than 0.05**, we **fail to reject the null hypothesis**. This suggests that **there is no strong association** between preferred learning methods and the perceived importance of integrating business with engineering and technology.

Both tests indicate **no significant relationship** between the tested variables. This suggests that other factors may influence these relationships, such as **economic conditions, access to resources, or government policies**.



1. Bar Chart for Challenges Faced vs. Willingness to Participate in Skill-Development Programs
2. Stacked Bar Chart for Preferred Learning Methods vs. Importance of Integration of Business & Technology



1. Bar Chart: Challenges Faced vs. Willingness to Participate in Skill-Development Programs

Shows the distribution of different challenges students face and their willingness to participate in skill-development programs.

2. Stacked Bar Chart: Preferred Learning Methods vs. Importance of Business & Technology Integration

Illustrates how different learning methods relate to the perceived importance of integrating business and technology education.

5. FINDINGS:

1. Strong Support for an Interdisciplinary Education Model

A significant **93.4% of respondents** support integrating business, engineering, and technology into education, indicating widespread recognition of its benefits.

2. Preference for Practical and Online Learning Methods

39.6% of respondents believe **practical workshops and hands-on training** are the most effective learning method in rural areas.

29.2% favor **online classes**, highlighting the potential of digital education in overcoming geographic barriers.

3. High Demand for Digital and Entrepreneurial Skills

The most needed skills for rural students include **digital literacy (31.1%)**, **business and entrepreneurship (25.5%)**, and **communication skills (24.5%)**.

These findings suggest that a combination of technical and business knowledge is essential for success.

4. More Support is Needed for Higher Education in Rural Areas

34% of respondents believe that the government and private organizations are not doing enough, indicating a need for additional funding, resources, and policy initiatives.

6. SUGGESTIONS:

- **Improve Accessibility:** Introduce mobile training centers and online courses for remote learners.
- **Financial Support:** Offer scholarships, stipends, and financial aid for skill-development programs.
- **Community Awareness:** Conduct local campaigns to educate communities on learning opportunities.
- **Hybrid Learning:** Combine practical workshops with digital learning for better engagement.
- **Localized Content:** Develop courses tailored to rural job markets and local industries.
- **Industry Collaboration:** Partner with businesses for internships and real-world training.
- **Government & NGO Support:** Advocate for better infrastructure, policies, and funding.
- **Mentorship Programs:** Connect students with industry professionals for career guidance.
- **Entrepreneurship Training:** Integrate business and tech education to encourage self-employment.

7. CONCLUSION:

Education is a critical driver of socio-economic development, and integrating engineering, business, and technology education in rural India presents both challenges and opportunities. The findings of this study indicate that while students and communities recognize the value of such integration, their willingness to participate in skill-development programs is not significantly influenced by the specific challenges they face. Similarly, learning preferences do not strongly determine the perceived importance of integrating business with engineering and technology, highlighting the influence of external factors such as accessibility, affordability, and awareness.

Despite the absence of a strong statistical correlation, qualitative insights suggest that financial constraints, lack of infrastructure, and limited access to technology are key barriers preventing students in rural areas from benefiting fully from an integrated education system. Addressing these challenges requires a multi-pronged approach that includes

improved educational infrastructure, government policy support, industry collaboration, and localized curriculum development.

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