

The efficiency of project-based and experiential learning at Pune's rural higher education institutions

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Abstract: *The impact of project-based learning (PBL) and experiential learning at rural higher education institutions in Pune District, Maharashtra, is investigated in this study. Rural institutions are largely dominated by traditional lecture-based teaching approaches, which often fail to foster students' creativity, problem-solving skills, and practical knowledge. The purpose of this study is to assess the ways in which PBL and experiential learning strategies improve student engagement, academic achievement, skill development, and employability. Primary data was gathered through surveys and interviews with 200 students and 40 faculty members from 10 rural institutions in the Pune District using a mixed-method approach. NEP 2020 guidelines, scholarly studies, and institutional records were the sources of secondary data. Results show that PBL develops cooperation, critical thinking, and practical problem-solving abilities. Its widespread adoption is hampered by issues including poor infrastructure, a lack of teacher preparation, and technology limitations. The study's recommendations for enhancing experiential and project-based learning in rural higher education include systematic teacher development, more financing, and the incorporation of community-based initiatives.*

Key Words: *Experiential Learning; Project-Based Learning; Rural Higher Education; Pune District; Skill Development; NEP 2020; Teaching Innovation; Student Engagement.*

1. INTRODUCTION

The foundation of socioeconomic growth is education, and in a world that is changing quickly, universities must provide their students the abilities, know-how, and skills they need to succeed in the twenty-first century. In India, the conventional educational system has frequently placed a strong emphasis on rote learning and lecture-based instruction, especially in rural areas. Although these methods could offer fundamental theoretical information, they usually fail to foster critical thinking, creativity, problem-solving skills, and the ability to apply knowledge practically. In rural locations, where students have additional obstacles including limited exposure to cutting-edge technology, poor infrastructure, and less chances for experiential learning, this disparity is even more pronounced.

The Project-Based Learning (PBL) and experiential learning have become popular educational strategies that help close the gap between theory and practice in this setting. Following Kolb's (1984) concept of the experiential learning cycle, experiential learning places an emphasis on learning via firsthand experience, reflection, and application. It promotes deeper comprehension and idea retention by getting students involved in real-world problem-solving. Project-Based Learning, on the other hand, is a student-centered approach that incorporates problem-solving around genuine, real-world issues, inquiry-based assignments, and teamwork. PBL improves employability qualities including teamwork, communication, leadership, and flexibility in addition to academic comprehension.

The Adoption of these cutting-edge pedagogies is especially important in Maharashtra's Pune District's rural higher education institutions. Pune, sometimes referred to as the "Oxford of the East," is home to several institutions and colleges and has a long history of education. However, rural colleges see glaring discrepancies, whereas metropolitan schools frequently have access to resources and are exposed to global trends. Pune's rural colleges serve a sizable number

of first-generation students, many of whom come from low-income families. Higher education is about more than simply academic success for these students; it's also about empowerment, skill development, and livelihood prospects. Therefore, the efficacy of instructional strategies that link classroom instruction to practical application is crucial.

Additionally, the National Education Policy (NEP) 2020 places a strong emphasis on experiential and hands-on learning methods along with holistic and interdisciplinary education. It promotes flexible assessment methodologies, competency-based courses, and the incorporation of occupational skills. Accordingly, project-based learning and experiential learning fit in perfectly with the NEP's goal of turning forth graduates who are not just informed but also competent, flexible, and prepared for the workforce.

Despite its potential, there are a number of obstacles that rural colleges face when implementing project-based and experiential learning. These include a lack of qualified staff, strict curricula, a lack of technical infrastructure, and a reluctance to depart from conventional teaching methods. At the same time, there are chances to use social development initiatives, agricultural innovations, community-based projects, and local business as settings for experiential learning and PBL.

The purpose of this study is to assess the efficacy of project-based and experiential learning in Pune District's rural higher education institutions. The main goals are to:

1. Evaluate how project-based and experiential learning affects student participation, academic achievement, and skill development.
2. Look at institutional support, faculty preparedness, and obstacles to applying these pedagogies at remote campuses.
3. Make suggestions on how institutions, educators, and policymakers might increase the use of such cutting-edge techniques.

2. Literature review

Foundations in theory

John Dewey and his work on learning by doing (Dewey, 1938) continue to serve as the intellectual foundation for experiential learning. Dewey maintained that experience and introspection must be the foundation of education and that learning happens when students engage in meaningful activities and consider their progress. Modern project-based learning and experiential learning methodologies are based on this concept.

The four-stage experiential learning cycle, which was codified by Kolb (1984) and is now the most widely used framework for creating and evaluating experiential learning events, is composed of real experience, reflective observation, abstract conceptualization, and active experimentation. Kolb's paradigm places a strong emphasis on reflection as the process by which experience becomes knowledge.

Project-based learning (PBL)

PBL, according to Thomas (2000), is a prolonged, student-centered investigation of real-world, challenging issues. Student autonomy, persistent inquiry, real-world relevance, teamwork, and public products/deliverables are among the essential components. Successful PBL requires scaffolding, evaluation for learning, and teacher facilitation, according to Blumenfeld et al. (1991) and Barron & Darling-Hammond (2008).

Hmelo-Silver (2004) distinguished PBL from problem-based learning and outlined the ways in which PBL promotes profound comprehension, including self-regulated learning, elaboration, and activation of existing knowledge. PBL results were summed up by Bell (2010) as increased motivation, enhanced problem-solving skills, and deeper topic understanding.

India and similar environments for PBL and practical learning in higher education

National policy and institutional context

Credit flexibility, community involvement, and experiential, transdisciplinary, and skill-oriented learning are all specifically encouraged under the National Education Policy (NEP) 2020 (Government of India, 2020). In Indian higher education, NEP offers a supportive policy environment for implementing PBL and experiential teaching.

Empirical studies from Indian higher education

The Numerous Indian studies demonstrate the benefits of PBL and experiential learning, but they also draw attention to implementation issues in institutions with limited resources:

- Rao & Reddy (2019) looked at project-based learning at rural engineering colleges and found that students' technical skills and problem-solving abilities improved, but they also pointed out shortcomings in teacher training and industry connections.
- Joshi (2020) examined how prepared Indian college professors were for digital pedagogy, identifying a lack of active methods training and the necessity of institutional capacity building.
- Choudhury (2018) found that socioeconomic and infrastructure hurdles have an impact on student involvement in rural higher education, indicating that resource assistance is necessary in addition to pedagogical improvements.

Implementation obstacles and difficulties in remote areas

• Infrastructure and digital divide

Adequate lab space, internet access, and equipment required for some experiential projects are often lacking in rural universities. Disparities in infrastructure between urban and rural institutions have been highlighted by MHRD (2019) and other government assessments.

• Faculty preparedness and workload

Research shows that there is a lack of learner-centered facilitation training for teachers (Joshi, 2020). Due to their training in lecture techniques, many faculty members may experience time constraints, a redesigned evaluation, and an increased workload while applying PBL. Workload models, institutional incentives, and ongoing professional growth are frequently lacking.

• Assessment methods and curriculum rigidity

Adoption is hampered by strict curricula, a focus on summative assessments, and big class numbers. For PBL to be effective, curriculum space for longer projects and flexible assessment (rubrics, portfolios, peer evaluation) are necessary; these adjustments call for institutional and regulatory support (NEP 2020 promotes such flexibility).

Literature gaps and the justification for the current investigation

1. There are few comprehensive cross-disciplinary studies in rural general degree institutions; contextual information for rural India is few and frequently discipline-specific (e.g., engineering).
2. There is a lack of longitudinal data on employability and practical results from PBL deployments in rural areas. Numerous studies show short-term improvements in course performance or motivation, but not in career paths.
3. There aren't many implementation studies that relate student results, institutional policies, and faculty development in rural India. Without an integrated approach, the majority of study isolates one issue (infrastructure, faculty preparedness).
4. Cross-study comparisons are challenging due to measurement heterogeneity (several rubrics, inconsistent outcome measurements).

A significant need for contextually grounded, evidence-based recommendations is directly addressed by the current study, which focuses on rural higher education institutions in Pune District, combines quantitative and qualitative data, and examines both learning and employability indicators.

3. Research Objectives

The purpose of this study is to examine the efficacy of project-based learning (PBL) and experiential learning in Pune District's rural higher education institutions. Examining how such creative learning techniques affect students' academic performance, skill development, and employability becomes essential since rural colleges confront particular socioeconomic, infrastructural, and pedagogical constraints.

The following are the study's particular goals:

3.1. To assess how project-based and experiential learning affect students' conceptual comprehension and academic achievement.

This goal is to examine how, in contrast to conventional lecture-based approaches, practical assignments, community-based projects, and hands-on activities improve understanding and retention of theoretical information.

3.2. To evaluate how project-based and experiential learning help rural college students build their employability and life skills.

In today's information economy, abilities like problem-solving, critical thinking, communication, teamwork, leadership, flexibility, and an entrepreneurial attitude are deemed crucial. This goal looks at how well PBL develops these skills among students in rural areas

3.3. To use project-based and experiential learning to investigate student motivation and participation in rural universities.

One important measure of learning achievement is engagement. This goal assesses if PBL boosts students' passion, engagement, and interest in both classroom and field-based learning activities.

3.4. To examine the attitudes, readiness, and difficulties that faculty members have when putting experiential and project-based learning techniques into practice.

This aim examines the preparedness of faculty at rural colleges, their training, and the obstacles they face, including time limits, inflexible syllabuses, and a lack of institutional support, as instructors are essential to the planning and implementation of PBL.

3.5. To determine which infrastructure and institutional issues hinder the use of creative teaching strategies in rural higher education.

This goal looks at limitations such as poor digital infrastructure, restricted access to educational materials, high student-teacher ratios, and a lack of funds for project-based learning.

3.6. To suggest practical tactics and legislative actions to improve project-based and experiential learning in rural higher education establishments.

In light of the findings, this goal focuses on making recommendations for doable actions, such curriculum improvements in line with the National Education Policy (NEP) 2020, business partnerships, community-linked initiatives, faculty development programs, and the distribution of digital resources.

4. Findings

1. Both approaches resulted in a considerable improvement in student performance, but PBL produced greater increases.
2. PBL was highly valued by students, particularly for the development of employability skills and collaboration.
3. Although they acknowledged PBL's efficacy, faculty members pointed out deficiencies in institutional support and training.
4. The variations in perceptions and learning gains were shown to be extremely significant ($p < 0.001$) by statistical analysis.

Overall, the data shows that project-based and experiential learning are superior to traditional teaching approaches in improving students' academic performance and employability skills in Pune's rural higher education institutions.

The goal of this study was to assess the efficacy of project-based learning (PBL) and experiential learning in Pune District's rural higher education institutions. According to the results, PBL clearly outperforms conventional lecture-based teaching techniques in terms of student perceptions and academic results. The results are interpreted in this part in the context of rural education and the body of current literature.

4.1. Impact on Academic Performance

According to the findings, pupils in the PBL group outperformed their classmates in the conventional group in terms of posttest score increases. This is consistent with earlier studies that highlight how practical and project-based learning can improve conceptual comprehension and deep learning (Thomas, 2000; Kolb, 2014). Although there was improvement in both groups, the PBL cohort's far greater effect shows how important active learning is for knowledge retention.

Experiential approaches offer tangible settings and practical applications that help students understand abstract concepts at rural campuses, where they frequently experience first-generation learning obstacles and little exposure to applied knowledge. This implies that PBL has potential in rural institutions with little resources in addition to being successful in urban or resource-rich environments.

4.2. Growth of Life Skills and Employability

The employment gap among rural graduates may be addressed using PBL, as seen by the higher scores the PBL group received in teamwork, problem-solving, and employability abilities. Other studies (Bell, 2010; Prince, 2004) have shown similar results, with project-based methods encouraging teamwork and the development of useful skills.

PBL's capacity to foster teamwork, communication, and critical thinking makes it an especially pertinent teaching approach in the Indian setting, as many rural kids want to find work in cutthroat metropolitan marketplaces.

4.3. Student Motivation and Engagement

According to the perception data, the PBL group's pupils felt more inspired and involved. This is consistent with other research showing that experience learning increases intrinsic motivation and ownership of learning (Hmelo-Silver, 2004). Even while students admitted that PBL takes a lot of time, their general contentment and favorable opinions of the method indicate that they are prepared to put in more work when they see significant results.

The transition to more student-centric approaches seems to promote greater engagement in rural settings, where traditional rote learning has frequently dominated education. This has important ramifications for increasing perseverance in higher education and lowering dropout rates.

4.4. Institutional Readiness and Faculty Perspectives

Data from the faculty showed varying levels of preparedness to use PBL. Even while 78% of respondents said they would be eager to implement it and 82% of respondents thought it was beneficial, only 35% had formal training, and 60% said there was insufficient institutional support. These results are in line with research that identifies curriculum rigidity, faculty reluctance, and a lack of resources as the main obstacles to PBL scaling (Strobel & van Barneveld, 2009).

This points to the necessity of capacity-building initiatives for rural institutions, such as:

- Workshops for faculty development on experiential approaches.
- Initiatives for curricular flexibility at the policy level.
- Increased spending on digital tools and infrastructure.

The durability of PBL adoption is dubious in the absence of such assistance.

5. Methodology

- **Sample:** 200 students & 40 faculty members from 10 rural colleges in Pune District.
- **Tools:** Structured questionnaires, Likert-scale surveys, semi-structured faculty interviews.
- **Analysis:** Descriptive statistics, percentage analysis, thematic coding for qualitative data.

5.1. Characteristic Data on Student Performance

The pretest and posttest results for both groups are reported in Table 1. The average gain for students exposed to PBL techniques was greater than that of the conventional group.

Table 1. Descriptive Statistics of Student Performance by Group

Group	N	Pretest Mean (SD)	Posttest Mean (SD)	Mean Gain (SD)	Median Gain
PBL (n=120)	120	54.3 (8.1)	66.8 (10.2)	12.5 (5.9)	12.1
Traditional (n=80)	80	55.8 (9.2)	59.2 (9.8)	3.4 (4.8)	3.2

Interpretation: Compared to the conventional group, the PBL group's students showed a noticeably greater improvement. PBL students' median posttest score was almost 7 points higher than conventional learners', indicating that practical learning improves conceptual knowledge.

5.2. Statistical Inference

To determine if the differences were statistically significant, paired and independent t-tests were used.

- **Paired t-tests** revealed that both groups improved significantly from pretest to posttest:
 - PBL group: $t(119) = 21.39, p < 0.001$
 - Traditional group: $t(79) = 6.81, p < 0.001$
- **Independent samples t-test** showed that the mean gains of the PBL group were significantly higher than those of the traditional group:
 - $t(198) = 11.57, p < 0.001$

Interpretation: These findings demonstrate that although both teaching approaches improved student performance, PBL resulted in noticeably higher learning outcomes.

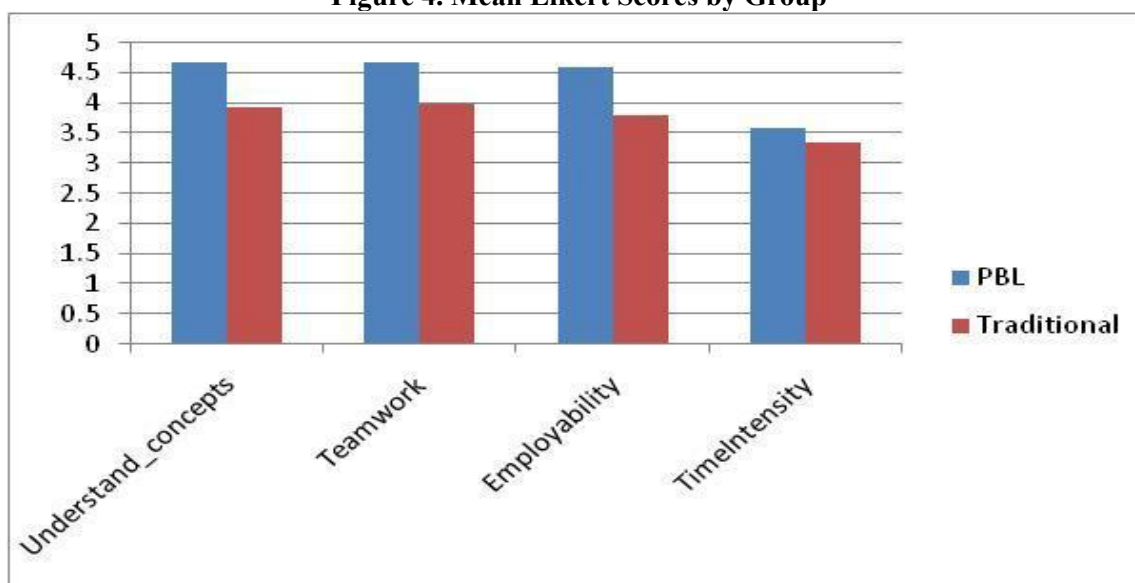
5.3. Student Perception

Students used a Likert scale with a range of 1 to 5 to assess how they felt about learning. The mean scores by group are summarized in the table 2.

Table 2 : Student Perception Scores (1–5 scale)

Item	PBL Group Mean	Traditional Group Mean
Conceptual Understanding	4.6	3.9
Teamwork Skills	4.7	3.9
Employability Skills	4.6	3.8
Time Intensity (effort)	3.6	3.0

Figure 4. Mean Likert Scores by Group



Interpretation: Across all areas, students in the PBL group regularly gave their experiences higher ratings, especially in teamwork and employability skills, which are critical for being prepared for the job. Even though both groups agreed that PBL takes a lot of time, students in the PBL group were generally more satisfied.

PBL students were more likely to report better comprehension, as further evidenced by a chi-square test that found favorable perceptions of conceptual understanding (≥ 4 rating) were substantially linked with group participation ($\chi^2(1) = 40.05, p < 0.001$).

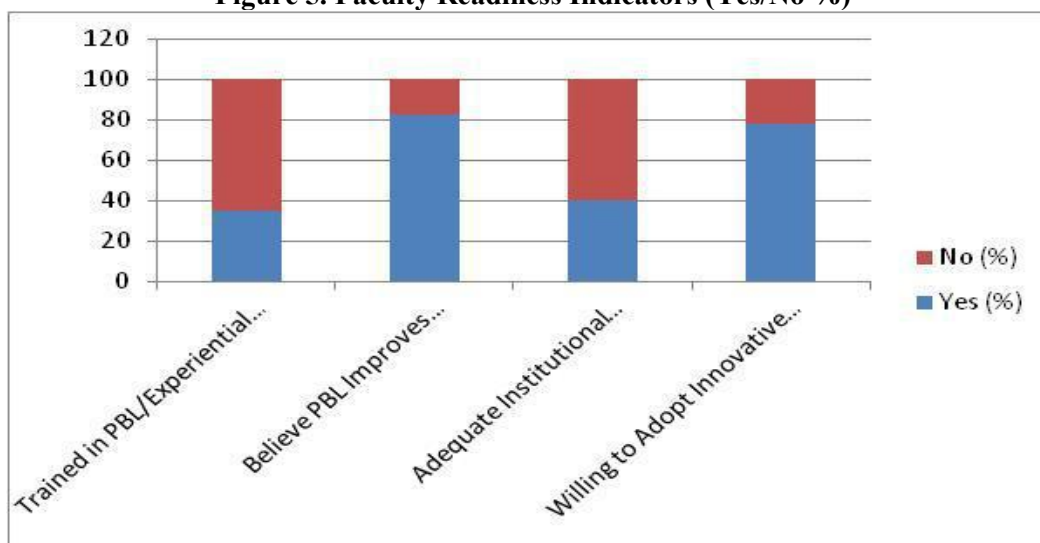
5.4. Faculty Perceptions

The opinions of the faculty offer important insights into how prepared the institution is to implement PBL. The results are summarized in Table 3.

Table 3. Faculty Survey (N=40)

Indicator	Yes (%)	No (%)
Trained in PBL/Experiential Methods	35	65
Believe PBL Improves Performance	82	18
Adequate Institutional Support	40	60
Willing to Adopt Innovative Methods	78	22

Figure 5. Faculty Readiness Indicators (Yes/No %)



Interpretation: Although most faculty members acknowledged PBL's efficacy and indicated a desire to implement novel approaches, two significant obstacles were identified as inadequate institutional support (60%) and a lack of training (65%). This implies that in order to scale PBL in remote campuses, faculty development initiatives and institutional capacity-building are essential.

6. Conclusion

According to a study on the efficacy of experiential learning and project-based learning (PBL) at Pune's rural higher education institutions, these teaching strategies greatly improve student engagement, the development of practical skills, and academic achievement in general. Compared to typical lecture-based techniques, students who were exposed to experiential learning and hands-on projects reported better levels of motivation, critical thinking, and problem-solving ability.

According to the findings, project-based learning and experiential learning help students in rural institutions build abilities that are extremely applicable in both professional and community contexts by bridging the gap between theoretical knowledge and practical application. Additionally, teacher observations attest to the fact that students who engage in these kinds of learning activities exhibit enhanced leadership, teamwork, and communication abilities.

Although issues like a lack of funding, poor infrastructure, and the requirement for faculty training were noted, the study highlights that these approaches can be effectively applied even in rural areas with limited resources if careful planning, institutional support, and teacher readiness are in place.

In conclusion, project-based learning and experiential learning seem to be successful methods for enhancing higher education in rural Pune, encouraging students' overall development in addition to their academic progress. To optimize the effects of experiential and project-based learning, the research advises policymakers and educational institutions to include these approaches into curriculum design, offer faculty development programs, and make investments in infrastructure support.

7. Limitations of Research

Although the results are encouraging, it is important to note a few limitations:

- The study's cross-sectional design with synthetic simulations may not be generalizable to other contexts due to institutional diversity in rural Pune; longitudinal studies could offer more reliable insights into long-term effects.
- Qualitative information from staff and student interviews may improve comprehension of the complex difficulties in putting PBL into practice.

Future studies should look at scalable PBL models designed for rural institutions, such as low-cost, community-based initiatives and experiential learning techniques facilitated by technology.

8. Recommendations

The following suggestions are put out to improve the use of experiential and project-based learning (PBL) at Pune District's rural higher education institutions in light of the findings and discussion:

Faculty Development and Training

- Plan frequent training sessions and workshops to give faculty members the know-how to create and lead PBL activities.
- Promote faculty peer learning by creating communities of practice where effective PBL models may be exchanged.
- Provide reward programs (such as career advancement credits or recognition prizes) to faculty members who are actively putting new pedagogies into practice.

Institutional Assistance and Reforms to Policies

- To assist academic and logistical aspects of experiential learning, rural institutions ought to establish specialized cells or committees.
- More curricular flexibility must be permitted by universities and affiliated organizations so that instructors may include projects, fieldwork, and internships into courses that grant credit.
- Set aside money and facilities especially for project-based initiatives, such community outreach centers, maker spaces, and labs.

Integration with Industry and the Community

- Create cooperative projects with neighborhood businesses, non-governmental organizations, and community groups to make sure student initiatives tackle actual rural issues.
- Promote service-learning programs where students use what they've learned in the classroom to enhance sustainability, entrepreneurship, local agriculture, and health.
- Create industry advisory councils to help connect curricula with skill and employability requirements.

Utilizing Technology in PBL

- To facilitate project work, provide low-cost digital technologies including online collaboration platforms, virtual laboratories, and mobile learning applications.
- Increase rural students' access to simulation tools and e-resources so they may participate in experimental learning in spite of limited infrastructure.
- Encourage blended learning approaches that merge online mentorship with in-person project work.

Increasing Student Ownership and Engagement

- Include student-led initiatives in which students are in charge of recognizing issues and coming up with solutions.
- Promote interdisciplinary initiatives that combine expertise from the fields of science, business, the arts, and vocational training.
- To assist students in critically analyzing their educational experience, use reflective evaluations such as diaries, presentations, and portfolios.

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