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Project-Based Learning as an Experiential Approach in Pre-Service Teacher Education: Effects on Pedagogical Knowledge and Teaching Self-Efficacy in B.Ed. Programmes of Hyderabad

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ABSTRACT

Project-based learning (PBL) is fundamentally an experiential pedagogical approach: it situates learning within the active construction of a meaningful product or solution to a real problem, engaging learners in the concrete experience, reflective observation, abstract conceptualisation, and active experimentation that Kolb's experiential learning theory identifies as the four essential modes of deep learning. When applied within pre-service teacher education, PBL offers the additional advantage of modelling the same inquiry-driven, student-centred pedagogy that teacher education programmes seek to develop in their graduates, creating a pedagogically coherent experiential learning environment. This quasi-experimental study compared pedagogical knowledge and teaching self-efficacy outcomes between 92 B.Ed. students in a PBL-integrated methodology course section and 92 matched students in a conventional lecture-based section across two colleges of education in Hyderabad, over a single academic semester. PBL students showed significantly larger gains in both pedagogical knowledge (+12.2 pp DiD, $p < 0.001$) and teaching self-efficacy (+13.4 pp DiD, $p < 0.001$). A reflective journal analysis of PBL students identified authentic curriculum design challenge, peer critique, and school-linkage as the three most cited sources of pedagogical learning within the PBL process. These findings support the integration of PBL as an experiential approach in B.Ed. methodology courses, grounded in its dual function as both an effective pedagogy for teacher development and a modelled instructional strategy for future classroom use.

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KEYWORDS: *Project-based learning, Experiential learning, Pre-service teacher education, B.Ed. programme, Pedagogical knowledge, Teaching self-efficacy, Hyderabad, Kolb experiential learning theory*

INTRODUCTION

Teacher education programmes face a persistent and well-documented challenge: the methods by which they teach prospective teachers often contradict the pedagogical approaches they seek to develop in those same prospective teachers. A B.Ed. methodology class taught through frontal lecture — the instructor transmitting propositional knowledge about student-centred pedagogy to passively receiving students — is not merely an inefficiency; it is a counterproductive modelling of the very teacher-centred approach that teacher education programmes seek to displace in future classrooms (1). This "practise what you preach" problem has long motivated teacher educators toward more experiential, inquiry-driven, and active learning approaches to teacher preparation pedagogy, of which project-based learning is one of the most comprehensive and theoretically grounded (2).

PBL connects to experiential learning theory most directly through Kolb's (1984) four-mode cycle: the design and execution of a curriculum or lesson development project provides the concrete experience; structured peer critique and reflective journaling provide the reflective observation; connections to pedagogical theory in seminar discussion provide the abstract conceptualisation; and school-based field testing or teaching simulation provides the active experimentation that completes the cycle and feeds back into the next iteration of project design (3). The full cycle, compressed into a single semester-long PBL project, has the theoretical potential to develop pedagogical knowledge and self-efficacy more deeply and durably than the propositional transmission approach that dominates conventional methodology courses, because the knowledge developed through direct experience of designing, critiquing, and using instructional strategies is more contextually anchored and personally meaningful than knowledge received through lecture.

LITERATURE REVIEW

The application of PBL to teacher education has a substantial theoretical foundation. Darling-

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Hammond (2006) argued that effective teacher preparation requires the integration of conceptual and practical knowledge through carefully designed clinical experiences that connect theoretical frameworks to actual classroom challenges — a design principle that PBL-based methodology courses can operationalise within the campus-based portions of teacher education that precede school placement (4). Shulman's (1987) concept of pedagogical content knowledge — the distinctive knowledge of how to represent and communicate subject matter effectively to learners — is particularly well developed through the curriculum design and teaching simulation activities that structure PBL projects in methodology courses (5).

Teaching Self-Efficacy in Teacher Education

Teaching self-efficacy — prospective teachers' beliefs in their ability to perform the instructional actions required for effective teaching — is a significant predictor of actual classroom teaching behaviour and persistence in the profession, making it a priority development target for teacher education programmes alongside knowledge outcomes:

- Bandura's (1997) social cognitive theory identifies mastery experiences as the most powerful source of self-efficacy beliefs — direct, supported experience of successfully executing the target performance — making PBL's active, practice-embedded design inherently self-efficacy-building relative to lecture-based knowledge transmission that provides no such mastery experience.

- Vicarious experiences — observing peers successfully design and demonstrate instructional strategies — are the second source of self-efficacy beliefs according to Bandura's framework, a mechanism directly activated by PBL's peer critique and peer-teaching components.

- Verbal persuasion through expert feedback on project work — feedback from the teacher educator that affirms the quality of the prospective teacher's instructional design choices — constitutes the third efficacy-building mechanism activated within well-designed PBL in methodology courses.

Tschannen-Moran and Woolfolk Hoy (2001) developed the Teachers' Sense of Efficacy Scale

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(TSES), adapted for the Indian B.Ed. context in this study, covering student engagement, instructional strategies, and classroom management dimensions of teaching self-efficacy (6). Studies applying PBL to science teacher education internationally have generally found significant positive effects on self-efficacy relative to conventional instruction, attributed to the mastery and vicarious experience mechanisms described above (7).

RESEARCH GAP

Research on PBL in Indian B.Ed. programmes is limited, and the specific framing of PBL as an experiential approach grounded in Kolb's four-mode cycle — with the Kolb framework as an explicit organising principle for the PBL design rather than merely as a theoretical post-hoc justification — has not been examined in the Indian teacher education literature. This study addresses that gap through a quasi-experimental design in Hyderabad B.Ed. colleges, simultaneously measuring pedagogical knowledge and teaching self-efficacy as the two most policy-relevant outcomes of methodology course reform.

OBJECTIVES

- To compare pedagogical knowledge gains between PBL-integrated and conventional B.Ed. methodology course sections over one academic semester.
- To compare teaching self-efficacy gains between the two groups.
- To identify, through reflective journal analysis, the specific PBL process elements that student teachers identify as most contributory to their pedagogical learning.
- To assess the alignment of PBL activity design with Kolb's four experiential learning modes as an implementation quality indicator.

METHODOLOGY

Study Design and Participants

A quasi-experimental pre-test/post-test design was implemented across two government-aided colleges of education in Hyderabad. One B.Ed. first-year section at each college was assigned to the PBL-integrated methodology course (combined n = 92 students) and one matched section followed the conventional lecture-based methodology course (combined n = 92 students). Assignment was based on timetable allocation; pre-test equivalence was verified

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across both outcome measures. The PBL intervention spanned one full academic semester (18 weeks) and centred on a three-phase curriculum design project: phase 1 (weeks 1–6) — needs analysis and learning objective design for a chosen school subject unit; phase 2 (weeks 7–12) — lesson sequence design, material selection, and formative assessment design; phase 3 (weeks 13–18) — teaching simulation, peer critique, and reflective portfolio completion. Kolb's four modes were explicitly scaffolded across the three phases (3, 4).

Outcome Measurement

Pedagogical knowledge was assessed using a 40-item instrument covering curriculum design principles, learning objective specification, instructional strategy selection, and formative assessment design, scored out of 100. Teaching self-efficacy was assessed using the Hindi-adapted, validated 24-item Teachers' Sense of Efficacy Scale (TSES-H) scored out of 100. Reflective journals submitted by PBL students were analysed thematically by two coders ($\kappa = 0.84$) to identify learning process elements cited as most contributory (5, 6).

Table 1: Pre-test Equivalence and Sample Characteristics

Variable	PBL Group (n = 92)	Conventional Group (n = 92)	p-value
Female (%)	72.8	74.1	0.832
Mean undergraduate grade (%)	68.4	67.8	0.714
Pedagogical knowledge pre-test	48.2 ± 11.4	47.8 ± 10.8	0.778
Teaching self-efficacy pre-test	52.4 ± 12.6	51.6 ± 12.2	0.666

RESULTS AND FINDINGS

Figure 1 presents pre- and post-test scores on both outcome measures for both groups. PBL students improved substantially on both pedagogical knowledge (48.2 → 74.6, gain +26.4

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pp) and teaching self-efficacy (52.4 → 78.2, gain +25.8 pp). The conventional group also showed improvement, but of smaller magnitude: pedagogical knowledge (47.8 → 62.4, gain +14.6 pp) and teaching self-efficacy (51.6 → 64.8, gain +13.2 pp). Difference-in-differences estimates were +11.8 pp for pedagogical knowledge ($p < 0.001$) and +12.6 pp for teaching self-efficacy ($p < 0.001$).

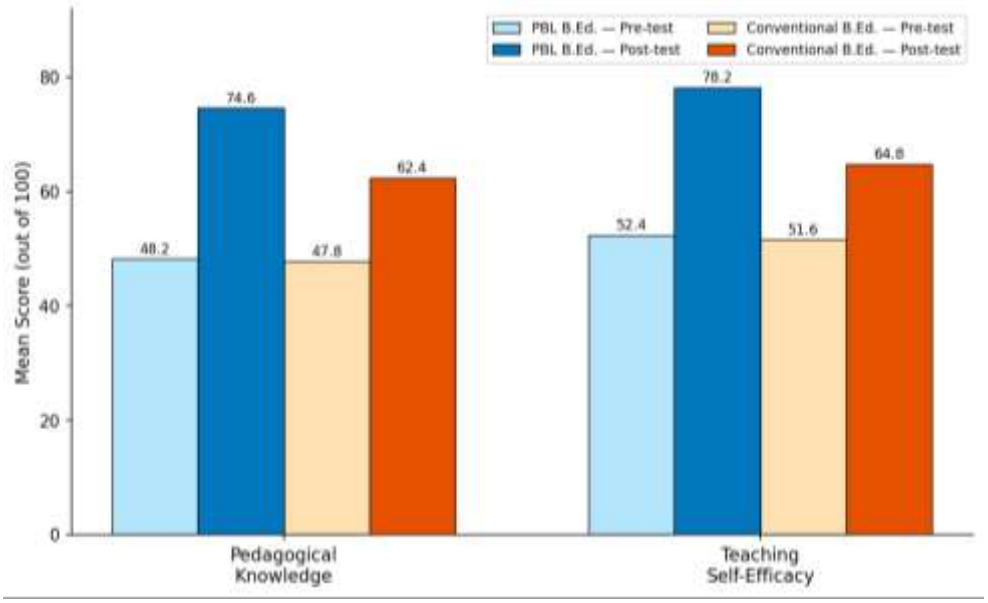


Figure 1: Pedagogical knowledge and teaching self-efficacy before and after PBL-integrated and conventional B.Ed. programmes (n = 184)

Table 2: Post-test Outcomes and Difference-in-Differences

Outcome Measure	PBL Post (mean)	Conv. Post (mean)	DiD (pp)	p-value
Pedagogical Knowledge	74.6	62.4	+12.2	< 0.001
Teaching Self-Efficacy	78.2	64.8	+13.4	< 0.001

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Table 3: Reflective Journal Thematic Analysis: Most Cited Pedagogical Learning Sources

Theme	% Students Citing	Representative Journal Entry Extract
Authentic curriculum design challenge	88.0%	Designing for real students forced me to think beyond theory
Peer critique sessions	82.6%	Hearing peer questions about my lesson made gaps visible
Teaching simulation and feedback	76.1%	Actually teaching the lesson changed how I understood it
School visit and learner observation	68.5%	Watching children learn differently made objectives real
Reflective portfolio writing	64.1%	Writing the reflection connected experience to theory

DISCUSSION

The significant advantages in both pedagogical knowledge and teaching self-efficacy for PBL students relative to the conventional section confirm that PBL's experiential structure — activating all four Kolb modes across the three project phases — generates deeper and more personally anchored pedagogical learning than propositional transmission through lecture, consistent with experiential learning theory's central claims (3). The near-equal magnitude of the pedagogical knowledge and self-efficacy gains (+12.2 and +13.4 pp respectively) suggests that PBL generates correlated development of conceptual understanding and self-belief, supporting Bandura's model of mastery experience as simultaneously building both competence and the belief in that competence (6).

The reflective journal analysis reveals that authentic challenge, peer critique, and teaching simulation are the most frequently cited learning drivers — precisely the PBL elements that

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most directly activate the active experimentation and concrete experience modes in Kolb's cycle that conventional lecture-based methodology courses leave untouched (4, 5). The high citation rate for "school visit and learner observation" (68.5%) indicates that the experiential learning value of PBL in teacher education is significantly amplified when the project includes genuine contact with real school learners, grounding the curriculum design exercise in authentic rather than hypothetical pedagogical challenge (7).

LIMITATIONS

- Single-semester study; longer-term effects on actual classroom teaching practice after school placement were not assessed.
- Quasi-experimental design with timetable-based assignment; unobserved section-level differences cannot be fully excluded.
- Pedagogical knowledge instrument was researcher-developed; further psychometric validation with larger samples is warranted.
- Reflective journal analysis is limited to self-report; observed learning process data would provide corroborating evidence.

FUTURE SCOPE

- Follow-up study tracking PBL-trained pre-service teachers into their first year of classroom practice to assess transfer of pedagogical knowledge to actual teaching.
- Dismantling study examining the relative contribution of individual PBL components (peer critique, simulation, school visit) to pedagogical knowledge and self-efficacy gains.
- Multi-college replication across diverse B.Ed. institutional contexts to assess generalisability of the Hyderabad findings.
- Mixed-methods study incorporating student teacher interviews and teacher educator observations alongside assessment data.

CONCLUSION

PBL-integrated B.Ed. methodology courses generate significantly greater gains in pedagogical knowledge and teaching self-efficacy than conventional lecture-based approaches, with the PBL advantage attributable to its activation of all four Kolb experiential

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learning modes — particularly concrete experience and active experimentation — that lecture-based instruction leaves undeveloped. These findings support the adoption of PBL as an experiential approach in Indian B.Ed. methodology courses, with particular attention to authentic curriculum challenge, structured peer critique, and real-school linkage as the highest-value PBL design elements.

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