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Indigenous-Based Experiential Learning and Pre-Service Teacher Innovativeness: Evidence from a Quasi-Experimental Study in West Bengal, India

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ABSTRACT

Aligned with India's National Education Policy 2020 mandate to integrate the Indian Knowledge System into teacher preparation, this study examined whether a 16-week Indigenous-based Experiential Learning intervention was associated with gains in pre-service teacher innovativeness. In a one-group pre-test/post-test quasi-experiment, 140 B.Ed. students across three West Bengal colleges engaged with indigenous craft traditions through four phases aligned with Kolb's experiential learning cycle. A Rasch-validated Teacher Innovativeness Scale showed significant gains across Fluency, Flexibility, Originality, and Elaboration ($dz = 0.74–1.14$, all $p < .001$). Reflective journals and Yarning Circles traced movement from procedural compliance towards community-connected professional identity amid persisting institutional constraints. Findings are preliminary associations, offering a provisional model for IKS-based experiential teacher preparation and an agenda for comparative research.

Keywords: experiential learning; indigenous knowledge systems; pre-service teacher education; quasi-experiment; rasch measurement; teacher innovativeness

INTRODUCTION

Teacher education systems across the Asia-Pacific region face the recurring challenge of preparing teachers capable of enacting ambitious policy reform. In India, the National Education Policy (NEP) 2020 mandates a shift towards experiential, holistic, and culturally integrated pedagogy grounded in the Indian Knowledge System (IKS) (Ministry of Education [MoE], 2020), and subsequent regulatory guidelines have operationalised this mandate by requiring IKS-related credits across all undergraduate and postgraduate programmes (University Grants Commission [UGC], 2023). Translating this mandate into pre-service teacher preparation, however, is far from straightforward. The central challenge is professional capacity—particularly the capacity for innovation: designing and enacting novel, contextually responsive pedagogical approaches that the policy envisions but that conventional, compliance-oriented teacher training rarely cultivates (Korthagen, 2004; Loughran, 2006; Priestley et al., 2015). Recent Indian scholarship similarly reports that IKS integration in teacher education remains constrained by curricular rigidity and a shortage of appropriately prepared faculty (Bera, 2026).

This study takes pre-service teacher innovativeness as its single focal outcome. Drawing on Torrance (1974) and structurally aligned with Guilford's (1967) model of divergent thinking—itself grounded in contemporary definitions of creativity as the production of novel and useful outputs (Runco & Jaeger, 2012)—teacher innovativeness here comprises four sub-dimensions: Fluency (generating multiple pedagogical ideas), Flexibility (shifting instructional approaches), Originality (producing novel lesson designs), and Elaboration (developing multi-component, layered activities). It is treated as a measurable, malleable professional capacity. Innovativeness is theoretically distinct from, but underpinned by, ecological agency (Priestley et al., 2015) and reflective professional identity formation (Beauchamp & Thomas, 2009; Kelchtermans, 2009; Korthagen, 2004); these constructs serve in the present study only as interpretive resources for understanding the qualitative texture of measured innovativeness gains, not as additional outcomes.

The study is guided by a primary research question and a single explanatory sub-question. Primary research question: To what extent was a 16-week Indigenous-based Experiential Learning (IbEL) intervention associated with pre-post gains in pre-service teacher innovativeness, as measured by a Rasch-validated scale? Explanatory sub-question: What professional identity shifts, evidenced in reflective journals and Yarning Circle discussions, accompany and help to interpret any measured innovativeness gains?

LITERATURE REVIEW

Two theoretical resources directly justify the design of the intervention. First, Kolb's (1984) experiential learning cycle—Concrete Experience, Reflective Observation, Abstract Conceptualisation, Active Experimentation—provides a structural template for sustained engagement with new pedagogical material, building on the longer Deweyan and Vygotskian traditions that locate learning in concrete experience and socially mediated activity (Dewey, 1938; Vygotsky, 1978). Second, the Funds of Knowledge framework (González et al., 2005; Moll et al., 1992) and the broader culturally sustaining and culturally responsive pedagogy literature (Hammond, 2015; Ladson-Billings, 1995; Paris, 2012) argue that community knowledge can serve as a legitimate intellectual resource for formal education when teachers are themselves equipped to recognise and deploy it. Recent cross-sectional evidence that education students'

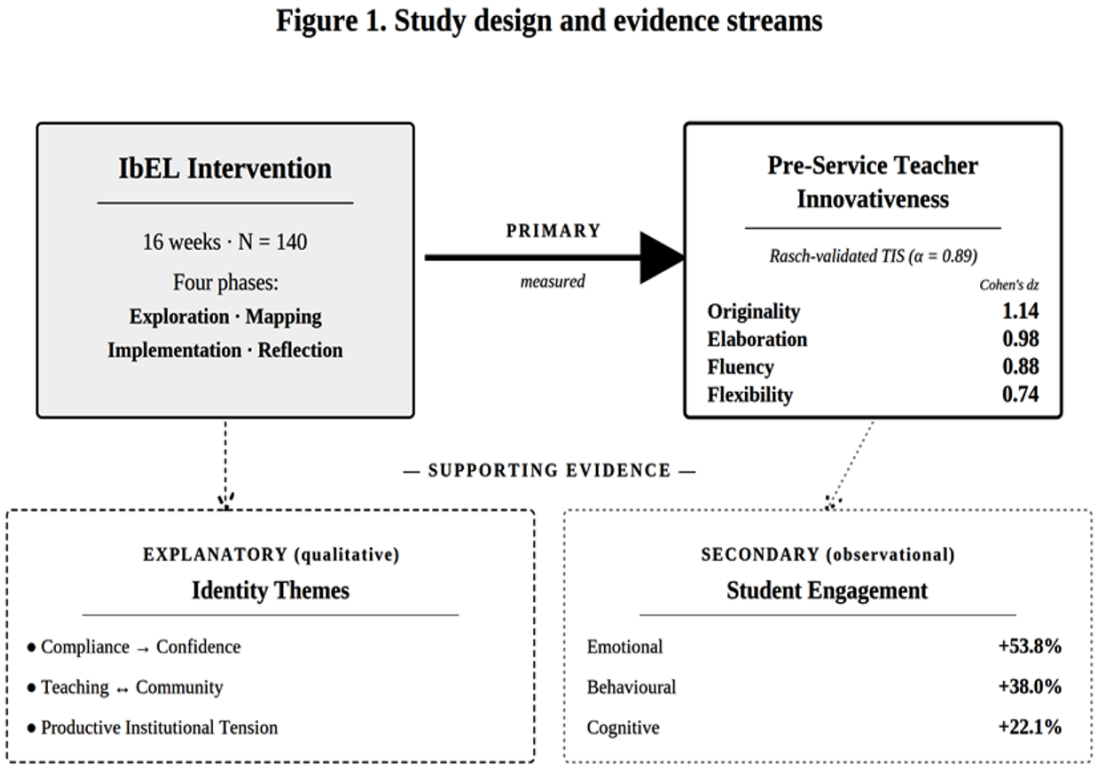
self-efficacy for culturally responsive teaching is measurable and varies with preparation experiences (Caingcoy, 2026) underscores the need for programmes that actively build this capacity rather than assume it. The wider decolonising methodologies literature (Smith, 2012) further reframes indigenous knowledge as epistemologically substantive rather than merely illustrative.

Kolb's model has itself attracted sustained critique that is relevant to a decolonising orientation. Systematic reviews question the model's under-specified treatment of what constitutes a concrete experience and argue that experience must be understood as contextually situated rather than individually abstracted (Morris, 2020), while indigenous and critical scholars caution that mainstream experiential learning frameworks can background community, place, and the power relations through which knowledge is produced and validated (Smith, 2012). The present intervention responds to these critiques deliberately: concrete experience is anchored in living community craft practices rather than decontextualised classroom simulations, and reflection is organised as collective, dialogic knowledge construction through Yarning Circles (Bessarab & Ng'andu, 2010) rather than as purely individual introspection, consistent with recent evidence that culturally mediated dialogic formats can support professional identity and agency among pre-service teachers from minoritised communities (Abu-gweder, 2026). Together, these theoretical resources predict that structured, cyclical engagement with indigenous craft traditions—as learners first, then as designers of pedagogy—should be accompanied by measurable gains in pre-service teacher innovativeness.

Notwithstanding the theoretical richness of this literature, empirical studies that quantify the relationship between indigenous-based experiential interventions and pre-service teacher innovativeness remain scarce. A recent scoping review of two decades of empirical work on Indigenous knowledge in initial teacher education identified only 35 studies, the large majority of which were small-scale and qualitative (Yip & Chakma, 2024). Recent additions to this literature continue the pattern: they document pre-service teachers' perceptions of, and willingness to engage with, Indigenous knowledge integration (Anor, 2025; Dlamini, 2026), and qualitative accounts of indigenous-story pedagogy identify teachers' limited preparation as the central barrier to classroom integration (Tetteh et al., 2025), but this work stops short of measuring professional outcomes with psychometrically calibrated instruments. Conversely, the growing quantitative literature on pre-service and in-service teachers' innovative capacity has concentrated on psychological and organisational antecedents—such as emotional intelligence, empowerment, engagement, structured digital-innovation training, and future-skills development (Eid & Al-Senaidi, 2025; Jiang & Tong, 2025; Polatbekova et al., 2025)—rather than on culturally grounded, IKS-based interventions. To the authors' knowledge, no published study has used Rasch-modelled innovativeness measures to examine professional growth following an IKS-integrated experiential teacher education programme. The present study addresses that gap, combining Rasch measurement with explanatory qualitative inquiry in a regionally situated but internationally relevant teacher education context.

The conceptual logic of the study can be summarised briefly. The IbEL intervention operationalises Kolb's (1984) cycle through four phases of engagement with indigenous craft knowledge; the Funds of Knowledge and culturally sustaining pedagogy traditions specify the mechanism—recognition of community knowledge as a design resource—through which that engagement is expected to expand pedagogical imagination; and the four Torrance–Guilford divergent-thinking dimensions define the measured outcome, teacher innovativeness, captured by the Rasch-validated Teacher Innovativeness Scale. Agency and identity constructs frame the explanatory qualitative strand, while classroom observation supplies secondary evidence of pedagogical quality. Figure 1 depicts these relationships among the intervention, the focal outcome, and the explanatory and secondary evidence streams.

Figure 1
Study Design and Evidence Streams



Note. The IbEL intervention (16 weeks; N = 140) is associated with measured gains in pre-service teacher innovativeness (primary outcome, Rasch-validated TIS). Explanatory qualitative themes (Compliance → Confidence; Teaching ↔ Community; Productive Institutional Tension) and secondary observational evidence (Student Engagement: Emotional +53.8%, Behavioural +38.0%, Cognitive +22.1%) contextualise the quantitative gains. Cohen's dz effect sizes shown for innovativeness sub-dimensions.

RESEARCH METHOD

Research Design

A one-group quasi-experimental pre-test/post-test design was employed. Random assignment was not feasible within the institutional structure of the participating teacher training colleges, where the B.Ed. programme operates as a structured cohort; separating students into experimental and control groups within the same institution would have introduced unacceptable contamination risks and created ethically indefensible inequities in programme access (Creswell & Creswell, 2018). A waitlist design would have required withholding an educational experience deemed potentially beneficial. Quantitative pre-post measures from the Rasch-validated Teacher Innovativeness Scale (TIS) were triangulated with two qualitative data sources—fortnightly reflective journals and Yarning Circle discussions—and one secondary observational source (Student Engagement Rubric, SER). The implications of this design for causal inference are addressed in the Limitations, and all findings are reported in associational rather than causal terms.

Participants

Participants were 140 pre-service teachers (N = 140) enrolled in the second-year B.Ed. programme across three Teacher Training Colleges in West Bengal, India. Institutions were purposively selected from three districts with documented indigenous craft traditions: Bankura (Dokra metalcasting), Birbhum (terracotta and clay work), and Purulia (jute and folk craft). This purposive selection is itself a boundary condition on transferability and is revisited in the Discussion. Inclusion criteria were: (a) current enrolment in the second-year B.Ed. programme; (b) willingness to provide written informed consent; and (c) ability to participate in all 16 weeks of the intervention. Of the 140 participants, 78 (55.7%) were female and 62 (44.3%) male; 112 (80.0%) were aged 21–25 years and 28 (20.0%) were aged 26–30 years. Subject specialisations comprised Science (n = 49, 35.0%), Mathematics (n = 35, 25.0%), Social Sciences (n = 28, 20.0%), and Languages (n = 28, 20.0%), and participants were distributed almost evenly across Bankura (n = 48), Birbhum (n = 46), and Purulia (n = 46). All 140 enrolled participants completed the intervention and both test administrations; no participant withdrew and no case was excluded from analysis, yielding an attrition rate of 0%.

The IbEL Intervention

The 16-week intervention was embedded within the Pedagogical Studies component of the B.Ed. programme. Indigenous materials—clay models, Dokra metalcraft, jute fancy handicraft bags, and woven jute mats—functioned as primary pedagogical tools rather than decorative props. Participants engaged with these materials first as learners and subsequently as designers of lessons. The intervention comprised four phases mapped onto Kolb's (1984) experiential learning cycle, depicted in Figure 2 and detailed in Table 1. Phase I (Exploration, Weeks 1–4) provided Concrete Experience through hands-on engagement with indigenous materials. Phase II (Mapping, Weeks 5–8) engaged Reflective Observation and Abstract Conceptualisation as participants designed culturally grounded lessons. Phase III (Implementation, Weeks 9–14) represented Active Experimentation, where pre-service teachers tested their designs in authentic classrooms. Phase IV (Reflection, Weeks 15–16) completed the cycle through Reflective Observation in Yarning Circles, synthesising learning for future practice.

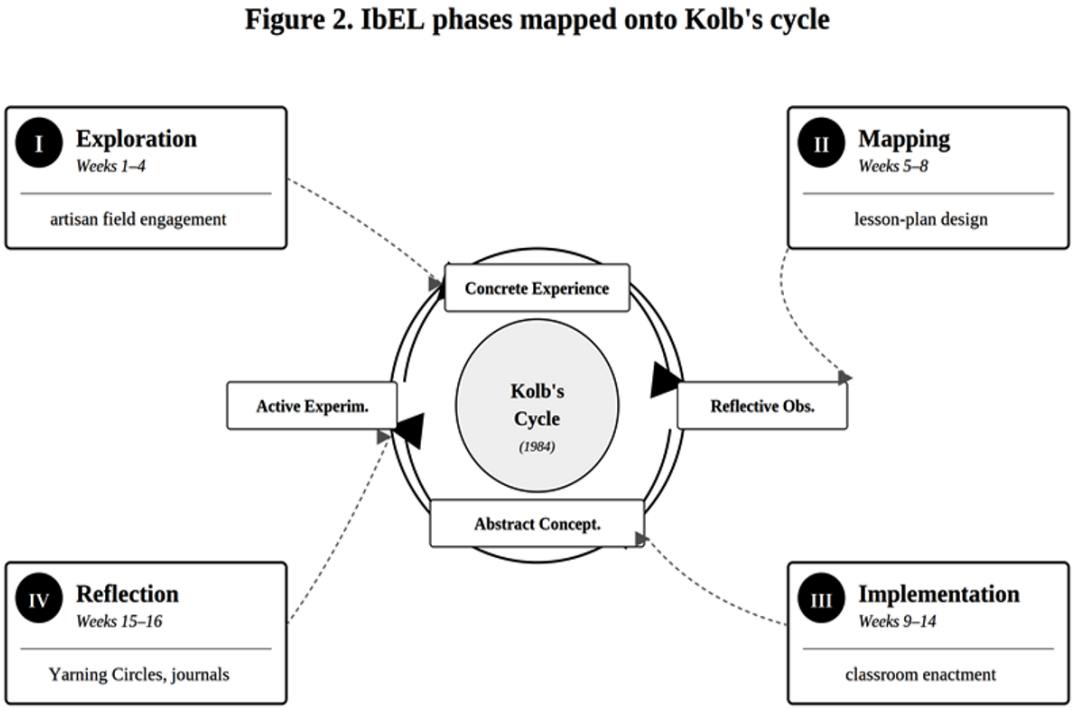
Table 1

The 16-Week IbEL Intervention: Phases, Materials, and Objectives

Phase	Weeks	Activities and materials	Objective	Output
I: Exploration	1–4	Field visits to artisan clusters; hands-on engagement with clay modelling, Dokra metalcraft, jute fancy handicraft bags, and jute mats; structured observation of artisan practice.	Identify and document community Funds of Knowledge; experience material-based learning as learners.	Indigenous Knowledge Map.
II: Mapping	5–8	Curriculum alignment workshops; culturally grounded lesson plan design using indigenous materials.	Bridge community knowledge with NEP 2020 learning outcomes; develop pedagogical design capability.	Lesson Plan Portfolio.
III: Implementation	9–14	Supervised classroom teaching in laboratory schools using clay models, jute mats, and jute handicraft bags as primary pedagogical tools.	Enact IbEL lessons in authentic classroom settings.	Classroom videos; teaching portfolio.
IV: Reflection	15–16	Yarning Circles; fortnightly reflective journal analysis; structured peer feedback.	Synthesise professional learning; consolidate reflective practice.	Reflective synthesis report.

Note. IbEL = Indigenous-based Experiential Learning; NEP = National Education Policy.

Figure 2
IbEL Phases Mapped Onto Kolb's Experiential Learning Cycle



Note. Phase I (Exploration, Weeks 1–4) — Concrete Experience through hands-on engagement with indigenous materials. Phase II (Mapping, Weeks 5–8) — Reflective Observation and Abstract Conceptualisation through culturally grounded lesson-plan design. Phase III (Implementation, Weeks 9–14) — Active Experimentation through classroom enactment. Phase IV (Reflection, Weeks 15–16) — Reflective Observation through Yarning Circles and structured peer feedback.

Implementation consistency across the three colleges was supported structurally rather than through a formal fidelity instrument: all three sites followed the same four-phase protocol, week-by-week activity schedule, and materials list (Table 1), the intervention was embedded in the same curricular component at each site, and phase outputs (Indigenous Knowledge Maps, lesson plan portfolios, teaching portfolios, and reflective synthesis reports) provided documentary evidence that each phase was completed as designed. The absence of a standardised fidelity checklist is acknowledged as a limitation.

The Yarning Circle format used in Phase IV was adapted from Aboriginal Australian deliberative practice (Bessarab & Ng'andu, 2010) for its non-hierarchical, dialogic structure. This adaptation was considered culturally consonant with Indian communal knowledge traditions such as chaupal (village councils) and gosthi (learning circles), which similarly emphasise collective dialogue and shared knowledge construction. The format was modified to align with local communication norms while retaining the core principles of egalitarian participation and narrative-based reflection.

Instruments

Teacher Innovativeness Scale (TIS)

The TIS is a 24-item, six-point Likert-type instrument whose items operationalise, in pedagogical terms, the four divergent-thinking dimensions defined by Torrance (1974) and Guilford (1967): Fluency, Flexibility, Originality, and Elaboration. Item content was written for the Indian initial teacher education context: items reference concrete pedagogical design behaviours (for example, generating alternative lesson approaches, incorporating locally available materials, and layering multi-component activities) rather than generic creativity, and the language was reviewed for accessibility to Bengali-medium B.Ed. students working in English. A purpose-built instrument was constructed because, to the authors' knowledge, no existing scale measured pedagogical innovativeness through these four divergent-thinking dimensions in an initial teacher education context.

Prior to the main study, the draft items underwent expert content review by a panel of three subject-matter experts—one specialist in teacher education, one in educational measurement, and one in Indian Knowledge Systems and regional craft traditions—who appraised each item for content relevance, cultural appropriateness, and linguistic clarity. Minor wording refinements followed this review, and no item was removed. The reviewed items were then piloted with a small group of second-year B.Ed. students from a non-participating institution to confirm comprehensibility and completion time. Psychometric quality in the main sample was then established through full Rasch diagnostic analysis, reported in the Results (Table 2), which functioned as the study's primary evidence of contextual measurement validity; internal consistency in the present sample was high (Cronbach's $\alpha = 0.89$). Construct validation deliberately followed a Rasch rather than a classical factor-analytic strategy: the Rating Scale Model is itself a confirmatory measurement framework, in which item and person fit statistics test whether responses meet the requirements of interval-level measurement, and Principal Component Analysis of standardised residuals supplies the dimensionality evidence that exploratory or confirmatory factor analysis provides within classical test theory (Bond & Fox, 2015). The TIS was administered at Week 1 (pre-test) and Week 16 (post-test) under standardised classroom conditions, in pen-and-paper format, with completion times of approximately 25–30 minutes per administration.

Student Engagement Rubric (SER)

The SER is a four-point standardised classroom observation instrument measuring Behavioural engagement (participation), Emotional engagement (security and joy), and Cognitive engagement (investment), consistent with the tripartite engagement framework of Fredricks et al. (2004). Two independent trained raters conducted all observations during Phase III. For each observed lesson, raters scored each engagement dimension on the four-point scale using behaviourally anchored descriptors, and dimension scores were averaged across observed lessons to yield baseline and post-IbEL means. Inter-rater reliability was acceptable (Cohen's $\kappa = 0.84$). Both raters completed a joint orientation to the rubric before Phase III, during which the behavioural anchors were discussed and applied to practice observations until consistent scoring was reached. Each participant was observed teaching at least one full IbEL lesson during Phase III; baseline ratings were taken during participants' initial supervised lessons early in the phase, and post-IbEL ratings during their final lessons in its closing weeks. Because the one-group design meant that raters necessarily knew which lessons followed the intervention, observations were not blind to intervention status, and expectancy effects cannot be excluded; SER data are therefore treated strictly as secondary evidence of pedagogical quality, not as primary outcome data on student learning.

Reflective Journals and Yarning Circles

Participants maintained fortnightly reflective journals across the full 16 weeks (eight entries per participant; total corpus ≈ 1,120 entries). Three Yarning Circle sessions were conducted during Phase IV, each comprising 10–12 participants and lasting approximately 90 minutes. Sessions were audio-recorded with consent and transcribed verbatim. The Yarning Circles were facilitated by members of the research team who had been oriented to the adapted format; facilitators were therefore not independent of the study, a circumstance acknowledged in the Limitations. To reduce facilitator influence, all sessions followed a common protocol that privileged participant-led narrative and rotating speaking turns. The TIS post-test was administered at the beginning of Week 16, after the first two Yarning Circle sessions but before the final session; the possibility that Phase IV reflective discussion primed post-test responding cannot be excluded and is likewise acknowledged in the Limitations.

Data Analysis

Quantitative data were analysed using the Rasch Rating Scale Model (RSM) via Winsteps software (version 4.9.3). The Rasch model converts ordinal Likert responses into linear logit measures, enabling interval-level assessment of latent trait change (Bond & Fox, 2015). Diagnostic statistics—Person and Item Reliability, Separation Indices, Infit/Outfit Mean Square (MNSQ) values, and Principal Component Analysis (PCA) of residuals—were examined before testing pre-post differences. Pre-post comparisons were conducted using paired-samples t-tests on Rasch logit measures in IBM SPSS Statistics (version 28.0); pre-post correlations across the four sub-dimensions ranged from $r = 0.31$ to $r = 0.39$ ($M = 0.35$), consistent with substantive change while preserving moderate person-level continuity. Effect sizes are reported as Cohen's dz for paired samples (mean difference divided by the standard deviation of difference scores), with 95% confidence intervals (CIs) for mean gains; effect-size benchmarks follow Cohen (1988). The interpretive consequences of the modest pre-post correlations for dz are considered in the Discussion.

Qualitative data were analysed thematically following Braun and Clarke's (2006) six-phase framework. Coding combined a deductive scheme—derived from the focal construct of innovativeness and interpretive constructs of agency and identity—with inductive refinement of participant-generated themes. NVivo 12 supported data management. Member-checking was conducted with eight purposively selected participants to test the credibility of emerging themes; no substantive disagreements arose.

Ethical Considerations and Trustworthiness

Ethical approval was granted by the Institutional Ethics Committee of Lovely Professional University (Protocol No. LPU/IEC/EDUC-26/5-15, dated 15 June 2025). All participants received an information sheet and provided written informed consent prior to enrolment; voluntary participation was emphasised, and participants were assured of their right to withdraw without academic penalty. Qualitative data are protected through pseudonymous coding, and journal excerpts are reproduced with participants' written permission. The study adhered to the ethical principles of the Declaration of Helsinki (1964; revised 2013). Credibility was supported through prolonged engagement across 16 weeks, independent inter-rater validation of the SER, and member-checking of qualitative themes; transferability is facilitated by detailed contextual description; and dependability was addressed through maintenance of an analytic decision audit trail.

RESULTS

Psychometric Validation of the TIS

The TIS was subjected to full Rasch diagnostic analysis before examining pre-post differences (Table 2). The Person Separation Index of 2.45 indicated that the scale discriminated among at least three distinct levels of teacher innovativeness; Item Reliability of 0.96 confirmed the stability of the item-difficulty hierarchy. All 24 items showed acceptable fit (Infit and Outfit MNSQ range: 0.72–1.34; recommended range 0.6–1.4; Bond & Fox, 2015). Person fit statistics indicated acceptable response consistency (Person Infit MNSQ range: 0.68–1.35; Person Outfit MNSQ range: 0.65–1.38), suggesting that all 140 participants responded in a manner consistent with model expectations; no participants were removed for misfit. Principal Component Analysis of residuals confirmed essential unidimensionality: the primary dimension accounted for 58.4% of variance, while the first contrast accounted for only 5.2%. The instrument therefore met the conditions for rigorous latent-trait measurement.

Table 2

Rasch Diagnostic Statistics for the Teacher Innovativeness Scale (N = 140)

Metric	Person statistics	Item statistics
Reliability	0.86	0.96
Separation Index	2.45	5.12
Mean Infit MNSQ (SD)	1.02 (0.18)	0.98 (0.14)
Mean Outfit MNSQ (SD)	1.05 (0.22)	1.01 (0.16)
MNSQ range (all items)	—	0.72–1.34
PCA primary dimension (% variance)	—	58.4

Note. MNSQ = Mean Square fit statistic; PCA = Principal Component Analysis of standardised residuals; SD = Standard Deviation. Acceptable Infit/Outfit MNSQ range = 0.6–1.4 (Bond & Fox, 2015).

Pre-Post Shifts in Teacher Innovativeness (Primary Outcome)

Pre- and post-intervention Rasch-modelled innovativeness measures across the four dimensions and the Total Score are presented in Table 3. Statistically significant gains were observed across all four dimensions and the Total Score (all $p < .001$). Following Cohen's (1988) conventions, effect sizes (dz) of 0.20–0.49 indicate small effects, 0.50–0.79 medium effects, and ≥ 0.80 large effects; on this benchmark, all observed effects in the present study exceeded the large-effect threshold. The largest shift was in Originality ($dz = 1.14$, $t(139) = 13.49$), indicating substantial change in the capacity to generate novel, non-formulaic pedagogical approaches. The gain in Elaboration ($dz = 0.98$, $t(139) = 11.60$) reflected a parallel change in the capacity to design layered, multi-component learning activities. Pre-intervention, most participants clustered at or below the mean item difficulty, suggesting that innovative behaviours felt professionally out of reach. Post-intervention, the person mean (1.52 logits) substantially exceeded the item mean (0.00 logits), indicating a recalibration of professional capability rather than marginal improvement.

Table 3

Pre- and Post-Intervention Innovativeness Measures in Logits (N = 140)

Dimension	Pre M (SD)	Post M (SD)	Gain	t(139)	p	dz	95% CI [LL, UL]
Originality	−0.45 (1.87)	1.98 (1.87)	+2.43	13.49	< .001	1.14	2.07, 2.79
Elaboration	−0.10 (1.48)	1.55 (1.48)	+1.65	11.60	< .001	0.98	1.37, 1.93
Fluency	0.12 (1.33)	1.45 (1.33)	+1.33	10.41	< .001	0.88	1.08, 1.58
Flexibility	0.05 (1.27)	1.12 (1.27)	+1.07	8.76	< .001	0.74	0.83, 1.31
Total Score	−0.09 (1.50)	1.52 (1.50)	+1.61	11.12	< .001	0.94	1.32, 1.90

Note. Standard deviations in parentheses. All paired comparisons are two-tailed. dz = Cohen's d for paired samples (mean difference divided by the standard deviation of difference scores). CI = Confidence Interval around the mean gain; LL = lower limit; UL = upper limit.

Professional Identity Themes (Explanatory Qualitative Evidence)

Thematic analysis of reflective journals and Yarning Circle discussions yielded three interconnected themes that help to interpret the texture of the measured innovativeness gains. These data are reported as explanatory rather than as parallel outcome measures.

Movement from Compliance to Confidence

Many participants initially framed teaching as procedural fidelity. One participant wrote in Week 2: "I always thought teaching meant following the lesson plan exactly as written. I never imagined the clay pot in my grandmother's house could become part of a geometry lesson." By Week 14 the same participant reflected: "When the children started asking questions I had not planned for, I realised I did not need to control every moment. The artefact was teaching them. That felt like real teaching for the first time." Such movement—from anxiety about deviation to confidence in improvisation—was consistent across approximately two-thirds of the journal corpus, and provides interpretive resonance for the measured Originality gains, where formulaic repertoires must give way to creative judgement (Korthagen, 2004; Loughran, 2006).

Reconnecting Teaching to Community

A recurring motif was a sense of professional re-rooting. One Yarning Circle participant noted:

> Growing up, I believed school and village were separate worlds. This programme showed me they do not need to be. When I brought the jute mat into the classroom and explained how my aunt weaves it, the children leaned forward. That does not happen with textbooks.

This theme aligns with the Funds of Knowledge proposition that recognising community knowledge transforms a teacher's relationship to learner experience (Moll et al., 1992), and helps to explain why participants generated more original, elaborated lesson designs after sustained material engagement.

Productive Tension with Institutional Constraints

Participants did not uncritically celebrate the experience. Several articulated structural friction encountered when enacting IbEL approaches in examination-oriented school placements. One participant observed: "The school did not have space for this kind of lesson — not because teachers do not want it, but because the timetable and board examinations leave no room. I found small openings, but it was hard." Rather than as a finding of failure, this is interpreted as evidence of developing critical professional judgement: participants had begun to identify structural constraints and seek creative openings within them, the kind of contextual reading that supports sustainable innovative practice (Priestley et al., 2015). An alternative reading of this theme is considered in the Discussion.

Student Engagement During IbEL Lessons (Secondary Evidence)

Classroom observations during the Implementation phase are presented as secondary evidence of pedagogical quality, not as primary outcomes on student learning. On the four-point rubric, Behavioural engagement (participation) rose from a baseline mean of 2.45 to 3.38 post-IbEL (+38.0%, $p < .01$); Emotional engagement (security and joy) rose from 2.12 to 3.26 (+53.8%, $p < .001$); and Cognitive engagement (investment) rose from 2.58 to 3.15 (+22.1%, $p < .05$). The largest observed gain was thus in Emotional engagement, with raters documenting spontaneous student questioning, visible enthusiasm around cultural artefacts, and descriptions corresponding to the rubric's security-and-joy category. Because raters were not blind to intervention status, these data indicate, modestly and with that caveat, that IbEL-

designed lessons generated affectively rich, culturally resonant classroom atmospheres consistent with the intervention's aims.

DISCUSSION AND CONCLUSIONS

Interpreting the Innovativeness Gains

The principal finding of this study is that the 16-week IbEL intervention was associated with substantial pre-post gains in pre-service teacher innovativeness across all four dimensions, with the strongest effects in Originality and Elaboration. These two dimensions—the ones most clearly requiring designerly, generative judgement rather than mere strategy switching—suggest that the intervention's association was strongest where it gave participants something specific and culturally resonant to design with. Working with materials—clay, Dokra figures, jute mats—rooted in participants' own cultural worlds offered a form of professional permission: an experiential demonstration that community resources are legitimate grounds for pedagogical invention (Moll et al., 1992; Paris, 2012). The smaller (though still large by conventional standards) gain in Flexibility ($dz = 0.74$, $t(139) = 8.76$) is consistent with this interpretation: switching among existing strategies was less directly addressed by the intervention than was generating new ones.

A note of statistical precision is warranted regarding the effect-size metric. Cohen's dz scales the mean gain by the standard deviation of individual difference scores, and that denominator depends on the pre-post correlation: the lower the correlation, the larger the variability of change and hence the more conservative the dz value. In the present data, pre-post correlations were modest ($r = 0.31$–0.39), so the standard deviations of the difference scores exceeded the within-occasion standard deviations, and the reported dz values are correspondingly smaller than a classical Cohen's d computed on raw-score standard deviations would have been. The dz values should therefore be read as gains evaluated against considerable heterogeneity in individual change—participants did not improve uniformly—rather than as inflated estimates.

Alternative Explanations for the Observed Gains

Because the design lacked a comparison group, the observed gains cannot be attributed to the intervention with confidence, and several alternative explanations must be stated explicitly rather than merely implied. Maturation is plausible: second-year B.Ed. students continue coursework and practicum experiences over any 16-week period, and some growth in pedagogical confidence would be expected without the intervention. Novelty and Hawthorne-type effects are equally plausible: the intervention was distinctive within the participants' programme, and heightened enthusiasm or awareness of being studied may have elevated post-test responding. Cohort and history effects cannot be excluded, since all participants belonged to a single academic cohort exposed to the same concurrent institutional events. Finally, the self-report format of the TIS leaves room for response-shift and social desirability influences, the non-blind observation procedure leaves room for rater expectancy in the secondary engagement data, and the scheduling of two of the three Yarning Circle sessions before the post-test leaves room for reflective priming of post-test responses. The magnitude and dimension-specific patterning of the gains—largest precisely where the intervention concentrated its design demands—are consistent with an intervention-related interpretation, but consistency is not demonstration. The findings therefore stand as preliminary associations awaiting comparative replication.

Situating the Findings in the Recent Empirical Literature

The claim of methodological novelty advanced here rests on the documented shape of the existing evidence base rather than on assertion. The most comprehensive recent synthesis of empirical work on Indigenous knowledge in initial teacher education located 35 studies over two decades, predominantly small-sample qualitative designs using interviews, focus groups, and reflective journals (Yip & Chakma, 2024); psychometrically calibrated outcome measurement is essentially absent from that corpus. Recent studies continue to concentrate on perceptions and readiness (Anor, 2025; Dlamini, 2026), and where indigenous content has reached classrooms, its use has been found to founder precisely on teachers' limited preparation to work with it (Tetteh et al., 2025)—a finding that strengthens the rationale for intervening, measurably, at the teacher-preparation stage. Complementary quantitative evidence that indigenous leadership practices substantially shape teachers' perceptions of educational relevance (Ababora et al., 2026) further indicates that indigenous knowledge functions as a live professional resource, not merely heritage content. Comparable quantitative pre-post evidence exists for other forms of innovation-focused teacher preparation—for example, structured digital-innovation programmes associated with significant gains on innovative work behaviour measures (Polatbekova et al., 2025)—but not, to the authors' knowledge, for IKS-based experiential interventions measured with Rasch-calibrated instruments. Two implications follow. First, the present study's contribution is best understood as an existence proof that such measurement is feasible in this domain, not as a definitive effect estimate. Second, the scarcity of published null or mixed results in this small literature almost certainly reflects reporting and publication biases as much as intervention efficacy; the field currently lacks the well-powered comparative studies in which weak or inconclusive outcomes could be detected and published, and the present findings should be weighed with that asymmetry in mind.

How Identity Themes Help Interpret the Innovativeness Gains

The qualitative themes are reported as interpretive supports rather than as parallel outcomes. The movement from compliance to confidence parallels Korthagen's (2004) account of growth from surface-level competency towards professional self-directedness—the dispositional condition under which originality becomes possible. The community-reconnection theme tracks the Funds of Knowledge claim (Moll et al., 1992) that recognising community resources transforms pedagogical imagination, and resonates with recent evidence that culturally mediated dialogue enables pre-service teachers to integrate inherited cultural values with contemporary pedagogical practice (Abu-gweder, 2026). The institutional-tension theme indicates that participants had begun to read structural conditions critically (Priestley et al., 2015). Together, these themes help explain why the measured innovativeness shifts emerged where they did, without claiming a separate full-scale identity intervention.

Institutional Constraints and the Sustainability of Innovation

The qualitative data are frank about constraints encountered when transferring IbEL approaches into examination-oriented schools. Teacher innovativeness, on this evidence, is not a purely individual capacity but an ecologically contingent one (Priestley et al., 2015): it depends on institutional affordances—timetable flexibility, assessment regimes, administrative support—as much as on personal professional development. Similar structural barriers to IKS integration, including curricular rigidity and examination pressure, have been reported in the recent Indian teacher education literature (Bera, 2026), and recent evidence that indigenous leadership practices shape teachers' perceptions of educational relevance (Ababora et al., 2026) reinforces this ecological reading: what school and community leadership legitimises, teachers find easier to sustain.

The interpretation of this theme as productive professional judgement deserves scrutiny, because a competing reading is available: the same journal entries could signal frustration and incipient disillusionment produced by structural constraints, a pattern that in other contexts predicts innovation abandonment rather than innovation persistence. Both readings are partially supported by the data, and they are not mutually exclusive. The interpretation of productive tension is preferred here on two grounds internal to the corpus: participants who described constraints typically also described specific openings they had located within them (as in the excerpt reported above), and constraint-talk in the Yarning Circles was predominantly framed in problem-solving rather than resigned registers. Nevertheless, whether this early critical judgement matures into sustained innovative practice or erodes into frustration under prolonged institutional pressure is an empirical question this study cannot answer; longitudinal follow-up into participants' early careers is needed to adjudicate between the two readings. Developing innovativeness in an enabling teacher-education environment does not guarantee its sustainability in a constraining school environment, and policy attention to school-level assessment practices and timetabling remains essential if NEP 2020's vision of experiential, IKS-grounded pedagogy is to be sustained beyond initial training.

Transferability: What Is Culturally Specific and What May Travel

Questions of transferability require care in both directions. The culturally specific elements of this intervention include the particular craft traditions engaged (Dokra metalcasting, terracotta, jute work), the purposive selection of districts precisely because those traditions are locally vital, the Bengali linguistic and communal context, and the policy tailwind supplied by NEP 2020's IKS mandate. Findings from these deliberately favourable conditions may not extend to Indian districts without prominent craft economies, still less to settings abroad. What may travel is the structural logic rather than the content: the four-phase sequence in which prospective teachers first learn from community knowledge holders and then design pedagogy with that knowledge; the treatment of community knowledge as an intellectual rather than decorative resource; dialogic, collective reflection formats adaptable to local deliberative traditions; and psychometrically calibrated measurement of innovativeness as an outcome. In settings without an NEP-style policy mandate, the framework would lose its regulatory driver and would need to be carried by institutional or accreditation-level commitments—for example, programme-level requirements for community-engaged pedagogy—and its feasibility under those weaker incentives is untested. International applicability is therefore framed here strictly as a promising avenue for future comparative inquiry, not as a demonstrated outcome of the present investigation.

Limitations and Future Directions

Several limitations require explicit acknowledgement. First, the absence of a control group means that maturation, history, novelty, and selection effects cannot be excluded as partial or full explanations for the observed gains. Second, no random assignment was used. Third, the purposive selection of districts with vigorous craft traditions constitutes deliberately favourable conditions, and the cultural specificity of West Bengal limits direct transferability to other Indian or Asia-Pacific contexts. Fourth, the 16-week timeframe captures proximal rather than longitudinal change. Fifth, reflective journal and self-report TIS data carry social desirability risks where participants knew their responses would be examined. Sixth, student engagement evidence is observational, was collected by raters who were not blind to intervention status, and provides only a secondary indication of pedagogical quality, not direct measurement of student learning. Seventh, no standardised intervention fidelity instrument was administered; implementation consistency rests on the common protocol and documentary phase outputs. Eighth, all observations occurred within the same institutional ecology and may reflect setting-specific dynamics. Ninth, the Yarning Circles were facilitated by members of the research team rather than by independent moderators, and two of the three sessions preceded the post-test; facilitator influence on the qualitative corpus and

reflective priming of post-test responses cannot therefore be excluded. Findings are therefore offered as preliminary, contextually grounded evidence rather than as causal estimates.

Future research should pursue matched-comparison or randomised waitlist designs where ethically and institutionally feasible; longitudinal follow-up of IbEL-prepared graduates into their first years of teaching, including explicit tracking of whether early critical judgement about institutional constraints consolidates or erodes; multi-state and cross-national samples spanning diverse cultural and institutional contexts, including settings without NEP-style policy mandates; direct measures of student learning outcomes rather than engagement proxies; blinded or video-based observation protocols; and adaptation of the IbEL model to in-service professional development.

Conclusions

This study provides preliminary, contextually grounded, Rasch-supported evidence that an Indigenous-based Experiential Learning intervention can be associated with measurable growth in pre-service teacher innovativeness, with the strongest gains in Originality and Elaboration. Qualitative themes from reflective journals and Yarning Circles help to explain these gains as the professional outworking of an uneven movement from compliance towards confident, community-connected pedagogical authorship—a movement that coexisted with continuing friction against examination-oriented institutional structures. Classroom observations, read with the caveat of non-blind rating, indicate that IbEL-designed lessons generated affectively rich learning environments. The study does not claim universal effectiveness; the design constraints urge caution, and rival explanations for the gains remain open. What it does suggest is a workable principle: that preparing innovative, culturally responsive teachers requires giving them direct, reflective, and professionally consequential encounters with the knowledge worlds their future students inhabit. Where comparable indigenous traditions exist—as they do across much of the Asia-Pacific—the structural logic of the IbEL approach can be adapted, tested, and critically refined by future comparative studies.

IMPLICATIONS

Three implications for teacher education merit emphasis. First, the findings provide focused, psychometrically supported preliminary evidence that culturally grounded experiential learning can accompany measurable creative capability in pre-service teachers, and not only diffuse cultural competence (Paris, 2012). Second, this study operationalises NEP 2020's IKS mandate as a concrete four-phase teacher-education programme rather than as a curricular gesture. Third, the study contributes to the international literature on culturally sustaining and decolonising teacher preparation (Ladson-Billings, 1995; Paris, 2012) by showing that indigenous craft traditions, when treated as intellectual resources rather than cultural footnotes, can reshape the professional imagination of the teachers who work with them.

Given the design constraints discussed above, the following recommendations are offered as provisional considerations for initial teacher education programmes, pending confirmation through comparative and longitudinal studies, rather than as validated prescriptions. (i) Curriculum design could treat indigenous knowledge as an intellectual resource rather than illustrative content, with phases that move from learner engagement to design. (ii) Field engagement could include structured visits to artisan clusters during early programme phases, with documented observation tasks. (iii) Lesson planning workshops could require culturally grounded designs that meet curricular standards, not run parallel to them. (iv) Community–artisan partnerships could be formalised through memoranda of understanding that recognise artisans as knowledge contributors. (v) Reflective practice could be scaffolded with fortnightly journals and dialogic formats such as Yarning Circles. (vi) Assessment of innovativeness could use psychometrically validated instruments—Rasch-calibrated where possible—rather than rubrics with unverified scaling properties.

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