**Enigma in Education**
https://enigma.or.id/index.php/edu

**e-ISSN: 3026-5827**

**ORIGINAL ARTICLE**
Enigma in Education | Vol. 3, No. 1 (2025) | pp. 1–8

# Building a Profession from the Ground Up: A Longitudinal Study of Teacher Professional Development and Pedagogical Innovation in Papuan Private Schools

**Iis Sugandhi[1*], Arya Ganendra[2], Aaliyah El-Hussaini[3], Gayatri Putri[4], Evelyn Wang[5], Anita Havyasari[6], Muhammad Hasan[7]**

[1]*Department of Art Sciences, Enigma Institute, Palembang, Indonesia*
[2]*Department of Literacy, Emerald Language Institute, Balikpapan, Indonesia*
[3]*Department of History Science, Al Fayyum Institute, Bursaid, Egypt*
[4]*Department of Library and Informatics Science, Enigma Institute, Palembang, Indonesia*
[5]*Department of Archeology, Samga Research Institute, Metro Manila, Philippines*
[6]*Department of Tourism, Nusantara Tourism and Heritage School, Makassar, Indonesia*
[7]*Department of Social Sciences, Enigma Institute, Palembang, Indonesia*

**ARTICLE INFO**

**Article history**
Received: March 18, 2025
Revised: April 14, 2025
Accepted: May 16, 2025
Available online: May 25, 2025
Published: May 30, 2025

**Keywords**
longitudinal mixed-methods study; Papua; pedagogical innovation; private schools; teacher professional development

**Corresponding author**
Iis Sugandhi
iis.sugandhi@enigma.or.id

**ORCID**
0009-0009-6338-3532

**DOI**
https://doi.org/10.61996/edu.v3i1.90

**ABSTRACT**

**Background.** Teacher quality is the strongest school-based influence on student success. Building professional excellence in remote, culturally diverse regions such as Papua, Indonesia, is nonetheless hard. Private school teachers can be isolated, and long-term research on teacher professional development (TPD) in this setting is scarce.

**Objective.** To investigate the impact of a sustained, collaborative TPD program on the pedagogical knowledge, self-efficacy and classroom practice of private school teachers in Papua.

**Methods.** A three-year (2021–2023) concurrent mixed-methods longitudinal study followed 50 teachers from five private schools in urban, semi-rural and remote highland Papua. The program centered on student-centered learning and culturally responsive pedagogy. Annual quantitative data came from the Teacher Pedagogical Knowledge Test (TPKT), the Teacher Self-Efficacy Scale (TSES) and a Classroom Observation Protocol, and qualitative data came from interviews, journals and focus groups with Professional Learning Communities (PLCs). Analyses were repeated measures ANOVA and thematic analysis.

**Results.** Mean TPKT scores rose from 48.5 (SD = 11.2) to 79.8 (SD = 8.5) ($F(1.78, 87.2) = 157.2$, $p < 0.001$, Greenhouse-Geisser corrected), and self-efficacy rose significantly ($F(1.81, 88.7) = 112.9$, $p < 0.001$). Classroom practice shifted markedly. It moved from teacher-centered to student-centered. Three themes emerged: (1) "From Transmission to Facilitation: A Pedagogical Awakening," (2) "The Power of the Collective," and (3) "Navigating the Cultural Interface."

**Conclusion.** In this single cohort, sustained, collaborative, context-specific TPD was associated with large gains in teacher knowledge, self-efficacy and classroom practice. The findings favor long-term models built on peer collaboration and cultural relevance over isolated workshops.

**Copyright:** © 2025 The Author(s). Published by Enigma Institute on behalf of Enigma in Education. The authors retain copyright of their work.

**Access license:** This is an open access article distributed under the terms of the Creative Commons Attribution–NonCommercial–ShareAlike 4.0 International License (CC BY-NC-SA 4.0), which permits non-commercial use, sharing, adaptation and reproduction in any medium, provided the original author and source are credited and any derivative work is distributed under the same license.

## 1. Introduction

Teachers sit at the center of quality education for all. A large body of work affirms that teacher quality is the most influential in-school factor for student achievement, social-emotional development and later life chances.[1] Few dispute that. Putting it into practice is another matter where geography isolates schools, incomes diverge and cultures differ sharply, and it remains one of the hardest problems in international education today. Papua is a telling case. This region of eastern Indonesia has rugged terrain, hundreds of distinct ethnolinguistic groups and a history of developmental inequity.[2] Private schools have become significant providers of basic education within this landscape, yet they remain under-researched.

Indonesia's education system is large and centralized, but it has long run public and private schooling side by side. Private institutions, often managed by religious organizations or community foundations, matter most where the state's reach is thin. In Papua they are no option for an urban elite. Frequently they are the only schools in remote highland and coastal communities, and they serve marginalized populations with a mission-driven ethos. Systemic hurdles often undermine that role. Many Papuan private school teachers come from local communities and enter the profession with minimal formal training, and afterwards they are cut off from the professional development networks and support that their public-sector counterparts can reach.[3–5] They must also teach a standardized national curriculum that may not resonate with the local cultural milieu. All of it happens in isolation.

Effective Teacher Professional Development (TPD) is the main way teacher quality is raised and kept high. Ideas about what makes it effective have changed a great deal over two

decades.[6,7] The traditional model of one-off, decontextualized workshops has drawn wide criticism, and it rarely produces lasting change in classroom practice.[4,8] Current scholarship favors TPD that is sustained over time, embedded in teachers' daily work, collaborative, and focused on specific subject matter and pedagogical techniques.[7] Recent syntheses add that the average effect of TPD on student achievement is small and varies widely, and that programs built on design principles such as coaching and cooperation appear to fare better.[9] Professional Learning Communities (PLCs), in which teachers inquire together into their practice, stand out as a high-impact strategy.[10] They foster shared responsibility, peer-to-peer learning and collective problem-solving.[11,12] Professional capital cannot be built from within without these qualities.

Pedagogical innovation in a culturally rich context like Papua cannot be separated from cultural relevance. Culturally Responsive Pedagogy (CRP) holds that teaching works best when it draws on students' cultural backgrounds, experiences and frames of reference.[13] Here it is central. For decades Papuan students have studied under a centralized curriculum that often ignores or marginalizes local languages, histories and indigenous knowledge systems.[2] Cultural alienation and disengagement from learning can follow. Any meaningful TPD initiative in Papua must therefore equip teachers to act as cultural brokers who bridge the national curriculum and their students' lived realities. That means more than adding cultural artifacts to lessons. Pedagogical approaches themselves have to become more communal, more narrative-driven and more connected to the local environment. Recent studies, including one in Indigenous schools on the Papua border, report that community-based, culturally grounded instruction improves learner outcomes,[14] and that sustained professional development can move teachers toward assets-based, culturally responsive practice.[15]

The need is plain, yet the scholarly literature has a significant gap. Little is known about the long-term impact of TPD in the private school sector in Papua. Some studies document the general educational challenges of the region[2] and others examine TPD across Indonesia,[3,5,16,17] but few, if any, have followed the professional trajectory of Papuan private school teachers over an extended period.[18] Most program evaluations are short-term. They cannot capture how new practices become embedded or how change is sustained. Policymakers and educational leaders are consequently left with little firm longitudinal evidence to guide investment and strategy. This study was designed to fill that evidentiary gap.

The primary aim of this three-year longitudinal study was to investigate how a sustained, collaborative and contextually adapted Teacher Professional Development program affected the pedagogical knowledge, self-efficacy and classroom practices of private school teachers in diverse settings across Papua, Indonesia. Its novelty is threefold. First, the longitudinal design goes beyond cross-sectional studies and short-term evaluations. By tracking the same cohort of teachers for three years, it gives rare insight into the process of professional growth: where teachers struggled, where breakthroughs came and when new practices consolidated. It also permits an analysis of whether change occurred, and of how and why it was sustained or abandoned over time. Second, the mixed-methods approach gives a holistic and nuanced picture of the TPD experience. The quantitative data supply firm evidence of change in key indicators. The qualitative data give teachers a voice, illuminating their lived experiences, their evolving beliefs and the interplay between the intervention and a challenging professional context. Third, the focus is on private school teachers in remote, culturally diverse Papuan settings. It is an important and underexplored niche. The study offers a "ground-up" perspective centered on educators who deliver services at the front line but sit at the periphery of professional support, and its lessons are relevant to educational development in other marginalized contexts worldwide.

## 2. Methods

### *2.1 Study design and setting*

The study used a concurrent mixed-methods longitudinal design. The approach was chosen because it gives a comprehensive picture of the TPD program's impact: objective measurements of change are integrated with a deep exploration of participants' experiences and perceptions over an extended period. It ran for 36 months, from January 2021 to December 2023. Data were collected at baseline (T1), midline (T2) and endline (T3).

The research took place in a network of five private, non-elite primary schools run by a single local educational foundation in the province of Papua, Indonesia. The schools were purposefully chosen to represent three geographical and socio-cultural settings, so that the diverse challenges teachers face in the region would be captured. One was an urban school in Jayapura. Two were semi-rural schools on the outskirts of Wamena. Two were remote highland schools reachable only by small aircraft.

### *2.2 Participants and sampling*

The cohort comprised 50 primary school teachers from the five schools who had agreed to take part in the full three-year study. Together they made up nearly 90% of the teaching staff. Purposive sampling aimed to include teachers with a wide range of experiences and qualifications, so as to reflect the teaching force in these schools.

### *2.3 TPD intervention*

The Teacher Professional Development (TPD) intervention was designed with the school foundation's leadership. The program was multi-faceted and grounded in established principles of adult learning, and it was meant to be sustained over time, context-specific to Papua, job-embedded in teachers' daily work and fundamentally collaborative. Three synergistic components made up the framework. The first was an Annual Intensive Workshop, a five-day session at the start of each academic year that introduced the theoretical foundations, beginning with constructivism and culturally responsive pedagogy and moving on to more advanced strategies such as differentiated instruction and formative assessment. To connect this knowledge to practice, a Job-Embedded Coaching and Mentoring program was started.[8] In a systematic monthly cycle, a pedagogical coach took teachers through a supportive, non-evaluative process of pre-observation dialogue, classroom observation and reflective feedback. The cornerstone of the program's collaborative and sustained character was the Establishment of Professional Learning Communities (PLCs). Teachers were organized into small school-based groups that met every two weeks for 90-minute sessions. Guided by structured protocols, these PLCs drove peer-led growth through shared lesson planning, joint analysis of student work and collective problem-solving of classroom challenges.[10]

### *2.4 Instruments and data collection*

Quantitative and qualitative data were gathered concurrently at three main time points: T1 (January-February 2021), T2 (January-February 2022) and T3 (November-December 2023). A broad suite of instruments was used longitudinally to build a triangulated picture of the intervention's impact. The quantitative arm measured changes in teacher knowledge, beliefs and classroom practice. Teacher pedagogical knowledge was assessed at T1, T2 and T3 with the Teacher Pedagogical Knowledge Test (TPKT), a validated 40-item multiple-choice instrument on student-centered learning and formative assessment. A modified 24-item Teacher Self-Efficacy Scale (TSES)[19], rated on a 9-point Likert scale, was administered at the same time to gauge professional confidence, meaning teachers' beliefs about their instructional and classroom management abilities. Direct observation complemented the self-reports. Using a structured Classroom Observation Protocol (COP), two

trained researchers quantified the implementation of targeted pedagogical practices across 15 indicators during biannual 45-minute observations.

The qualitative arm explored participants' lived experiences and gave narrative context to the numbers. In-depth, semi-structured interviews were held with all 50 teachers at the beginning and end of the study, and a sub-sample was also interviewed at the midline, to probe evolving beliefs, perceptions and challenges. Teacher Reflective Journals added to this. All participants kept them throughout the three years, writing a continuous, personal account of their practice and collaborative interactions in response to prompts every two weeks. Group-level dynamics mattered too. Focus Group Discussions (FGDs) were therefore held with each school-based PLC during the second and third years, to explore the role of PLCs in fostering collaborative innovation. For fidelity and accuracy, all interviews and focus groups were conducted in Bahasa Indonesia, audio-recorded with participants' consent and transcribed verbatim.

### 2.5 Data analysis

Quantitative and qualitative data were first analyzed separately and then integrated at the interpretation stage. Statistical software was used for all quantitative data, and descriptive statistics were calculated for every variable at each time point. Change in TPKT, TSES and COP scores across the three time points was tested with a series of one-way repeated measures ANOVAs. Mauchly's test checked sphericity. Where it was violated, a Greenhouse-Geisser correction was applied, and Bonferroni-corrected post hoc tests identified significant differences between specific time points. The qualitative data were managed in NVivo 12 and analyzed with a six-phase thematic analysis framework: familiarization, coding, theme generation, review, definition and reporting.[20] To enhance credibility, two researchers independently coded a subset of transcripts and established high inter-coder agreement, and peer debriefing followed.

### 2.6 Ethical considerations

Written informed consent was obtained from all participating teachers, who were assured of confidentiality, anonymity and the right to withdraw. Pseudonyms are used for all individuals and schools in this report. The study protocol was approved by Ethical Committee of Social Research, Enigma Institute, Indonesia (Approval number 2021/192).

## 3. Results

The results are presented in two parts. The first reports the quantitative findings from the repeated measures analysis, namely the size and statistical significance of the changes in teacher knowledge, self-efficacy and practice. The second reports the qualitative findings, organized around three major themes drawn from the interviews, journals and focus groups, which give narrative context to the numbers.

### 3.1 Participant characteristics

Table 1 shows the profile of the cohort. Most teachers were female (82.0%) and most were of Papuan ethnicity (76.0%). Their mean age was 34.7 years, in the mid-thirties, and they had taught for 8.2 years on average, with wide variation across the cohort. Qualifications deserve attention. A clear majority (60.0%) did not hold a standard four-year university degree in education. The largest single group (44.0%) held a two-year teaching diploma or a university degree in a field other than education, and 16.0% had only a high school diploma as their highest formal qualification. These figures underline the challenges of teacher recruitment and qualification in the region and the need for effective in-service professional development.

**Table 1. Sociodemographic characteristics of participants at baseline (N = 50).**

| Characteristic | Category | Value |
|---|---|---|
| Gender | Female | 41 (82.0%) |
| | Male | 9 (18.0%) |
| Age (years) | Mean (range) | 34.7 (22–54) |
| Teaching experience (years) | Mean (SD) | 8.2 (5.6) |
| Highest formal qualification | High school diploma | 8 (16.0%) |
| | Two-year diploma / non-education degree | 22 (44.0%) |
| | Four-year education degree (S.Pd.) | 20 (40.0%) |
| Ethnicity | Papuan | 38 (76.0%) |
| | Non-Papuan | 12 (24.0%) |

Note: N = total number of participants; SD = standard deviation. Percentages were calculated from the absolute numbers (n) and are given to one decimal place.

### 3.2 Quantitative findings

Every measured indicator rose consistently and significantly over the three years of the TPD intervention. A one-way repeated measures ANOVA on Teacher Pedagogical Knowledge Test (TPKT) scores showed a significant effect of time, $F(1.78, 87.2) = 157.2$, $p < 0.001$, Greenhouse-Geisser corrected (Table 2). Pedagogical knowledge grew from baseline (T1) to midline (T2). It grew again from midline to endline (T3). Post hoc tests showed that the increase in mean TPKT scores was significant from T1 to T2 ($p < 0.001$), from T2 to T3 ($p < 0.001$) and from T1 to T3 overall ($p < 0.001$).

**Table 2. Descriptive statistics and repeated measures ANOVA for TPKT scores (N = 50).**

| Time point | M | SD |
|---|---|---|
| T1 (baseline) | 48.52 | 11.21 |
| T2 (midline) | 67.88 | 9.84 |
| T3 (endline) | 79.80 | 8.53 |

Note: Maximum score = 100. Repeated measures ANOVA: $F(1.78, 87.2) = 157.2$, $p < 0.001$, partial $\eta^2 = 0.76$ (Greenhouse-Geisser corrected).

Self-efficacy grew in a similar way (Table 3). The repeated measures ANOVA on Teacher Self-Efficacy Scale (TSES) scores indicated a significant main effect of time, $F(1.81, 88.7) = 112.9$, $p < 0.001$, Greenhouse-Geisser corrected. Post hoc tests confirmed it. The mean efficacy score at T3 was significantly higher

than at T2 ($p < 0.001$) and at T1 ($p < 0.001$), and the T2 score was significantly higher than the T1 score ($p < 0.001$).

**Table 3. Descriptive statistics and repeated measures ANOVA for TSES scores (N = 50).**

| Time point | M | SD |
|---|---|---|
| T1 (baseline) | 5.81 | 1.25 |
| T2 (midline) | 7.15 | 1.05 |
| T3 (endline) | 8.02 | 0.95 |

Note: Scale from 1 (none at all) to 9 (a great deal). Repeated measures ANOVA: $F(1.81, 88.7) = 112.9$, $p < 0.001$, partial $\eta^2 = 0.70$ (Greenhouse-Geisser corrected).

Classroom Observation Protocol (COP) data gave direct observational evidence that gains in knowledge and self-efficacy translated into tangible changes in pedagogical practice. The repeated measures ANOVA on aggregated COP scores (Table 4) revealed a large and significant effect of time, $F(2, 98) = 215.4$, $p < 0.001$. Post hoc tests confirmed significant improvements between all three time points ($p < 0.001$ for all comparisons). Three indicators changed most: the use of group work, the posing of open-ended questions and the incorporation of local context into lessons.

**Table 4. Descriptive statistics and repeated measures ANOVA for COP scores (N = 50).**

| Time point | M | SD |
|---|---|---|
| T1 (baseline) | 1.89 | 0.45 |
| T2 (midline) | 3.24 | 0.61 |
| T3 (endline) | 4.11 | 0.52 |

Note: Scale from 1 (never observed) to 5 (consistently observed). Repeated measures ANOVA: $F(2, 98) = 215.4$, $p < 0.001$, partial $\eta^2 = 0.81$.

### *3.3 Qualitative findings*

Thematic analysis of the interviews, journals and focus groups illuminated the human story behind the numbers. It revealed the internal and collective processes that accompanied the observed changes, along with the persistent challenges teachers navigated. Three major themes emerged. Together they capture the essence of the three-year journey.

**Theme 1. "From Transmission to Facilitation: A Pedagogical Awakening"**

This theme captures a fundamental shift in teachers' core beliefs about their role, from transmitters of information to facilitators of learning. At baseline, most teachers described their main responsibility as delivering the curriculum as the textbook dictated.

> *"Before, my main goal was to finish the chapter. I would talk, they would write, and then I would give a test. If they passed, I was successful. I thought that was what a teacher did."* (Mrs. Y, Remote Highland School, T1 Interview)

Many described the TPD intervention as a catalyst for a "pedagogical awakening." It introduced them to theories of constructivism that differed profoundly from their own experience as students.

> *"My head was spinning after the first workshop. The idea that children construct their own knowledge... it sounded right, but it was so scary. If I am not the one giving them the knowledge, what is my job? Am I still in control?"* (Mr. M, Semi-Rural School, Year 1 Journal Entry)

Over time, through coaching and practical experimentation, this initial fear turned into a sense of professional empowerment.

> *"Now, my classroom is noisy, but it's a good noise. It's the noise of learning. I see myself as a guide. I prepare the environment, I pose a question, and then I walk among them, listening, probing, helping them when they are stuck. The learning is theirs, not mine. I just help them find it. It's much harder work, but the joy is a hundred times greater."* (Mrs. Y, Remote Highland School, T3 Interview)

**Theme 2. "The Power of the Collective: Embracing Professional Learning Communities"**

This theme centers on the important role of the PLCs in sustaining momentum and turning individual learning into a collective school culture. Professional isolation was extreme in this context. The PLCs became vital lifelines.

> *"In Papua, we have a culture of 'tunggu perintah' [waiting for orders]. At first, in our PLC, we were all quiet, waiting for the principal or the coach to tell us what to do. But then a teacher tried a group activity that failed spectacularly. She was brave enough to tell us about it. We all laughed, but then we all started sharing our own failures. That was the moment our PLC was truly born. We realized we were all in the same boat."* (Mr. A, Urban School, T2 Focus Group Discussion)

The PLCs served as incubators for practical innovation and as sources of emotional and motivational support. They also drove a cultural shift toward collective responsibility.

> *"There were days I wanted to go back to the old way. It was easier. But then I would go to my PLC meeting, and I would hear about a small success from a friend, or get a new idea for how to handle a difficult topic. It was like a weekly recharging of my spirit. I could not have done this alone."* (Mrs. A, Remote Highland School, T3 Interview)

**Theme 3. "Navigating the Cultural Interface: Challenges and Triumphs of Responsive Pedagogy"**

This theme captures the complex and rewarding journey of teachers who tried to make their teaching more culturally responsive. They negotiated between the national curriculum and their students' realities.

> *"For years, we were told that what happened at school was 'ilmu' [science/knowledge] and what happened in the village was 'adat' [custom]. We were taught not to mix them. So when the TPD asked us to bring local stories into the classroom, it felt... wrong, at first. Like we were breaking a rule."* (Mrs. M, Semi-Rural School, T1 Interview)

Through facilitated discussions and experimentation, teachers became innovators, finding creative ways to build pedagogical bridges.

> *"I was teaching multiplication. It was just numbers on a board, and the students were bored. In my PLC, we talked about it. The next day, I brought a pile of sweet potatoes to class. I asked them, 'If one family needs three sweet potatoes for dinner, how many do we need for all five families in our hamlet?' Suddenly, every child was focused. They were shouting out answers, arguing, counting. It was math, but*

*it was their math. It was about their lives."* (Mr. P, Remote Highland School, Year 2 Journal Entry)

The process affirmed the value of local culture within the formal education system. Student engagement and pride increased.

## 4. Discussion

### *4.1 Principal findings*

This three-year longitudinal study offers a rich and textured account of professional transformation among private school teachers in Papua. The quantitative data give a skeletal framework of significant growth. Only through the qualitative results does the flesh and blood of the journey become visible. This discussion goes beyond restating the results. It explores the anatomy of the change and deconstructs the psychological, social and cultural mechanisms behind the observed growth. We examine the shift from a transmissionist to a constructivist professional identity, the social engine that sustained the change, and the intricate process of weaving cultural relevance into everyday teaching. The exploration suggests a promising model for building a profession from the ground up in a challenging educational setting.

The quantitative results trace a clear and compelling arc of progress. The increases between successive measurement points in pedagogical knowledge (TPKT), self-efficacy (TSES) and student-centered practices (COP) are statistically significant and remarkable. Still, the numbers are the end product of a process that was far from linear. Qualitative data let us dissect the trajectory. They reveal a multi-stage psychological and professional evolution that can be characterized as a journey from dissonance, through experimentation, to eventual integration.

At the outset, baseline data showed a well-intentioned but professionally stymied teaching force. Low TPKT scores reflected more than missing knowledge. They reflected a deeply ingrained pedagogical paradigm. Mrs. Y described the teacher's role as that of a "transmitter," a conduit carrying information from textbook to student brain. Low COP scores confirmed a classroom of order, silence and passive reception. This was teaching born of tradition and limited exposure to alternatives, not of malice. Low self-efficacy followed naturally. Teachers felt responsible for student outcomes, but their pedagogical toolkit was so limited that they often felt powerless to engage learners who were disaffected or struggling, and their sense of efficacy was tied to a narrow definition of success: curriculum coverage and test scores.

Into this stable if limited ecosystem the TPD intervention arrived as a powerful disruptive force. The first workshops introduced constructivism and student-centered learning, and the qualitative data show that they created a profound "pedagogical awakening." It was not immediately joyful. It was a moment of deep cognitive dissonance. Mr. M's journal entry captures it: the new ideas were intuitively appealing ("it sounded right") and deeply threatening ("it was so scary"). Dissonance of this kind is a crucial first step in any transformative learning process, because it unsettles foundational beliefs about identity and purpose.[21] If the student is the active builder of knowledge, what is the teacher? Many voiced this question in the first year, and it became the engine of their later growth.

All three measures rose most between T1 and T2: about 61–62% of each T1–T3 gain (TPKT, TSES and COP) occurred in that interval. For the TPKT, this probably reflects acquisition of a new conceptual vocabulary and body of knowledge during that disruptive phase, as teachers learned the language of student-centered learning. Because classroom practice (COP scores) and self-efficacy rose over the same period, knowledge and practice appear to have moved together rather than in sequence. Job-embedded coaching[8] appears to have been important here. Coaches acted as translators and partners and helped teachers bridge the chasm between abstract theory and classroom reality. They also provided a psychological safety net. Teachers could try a group activity or an open-ended question for the first time and, crucially, fail without judgment. This pattern fits meta-analytic evidence that programs producing larger gains in teacher knowledge and classroom instruction also tend to produce larger gains in student achievement,[22] although student outcomes were not measured here.

The journey from T2 to T3 was a phase of consolidation and integration. Steady growth continued across all three quantitative measures, and new practices moved from tentative experiments to established routines. Teachers in an Indonesian professional development program likewise reported moving toward student-centered approaches after applying what they learned in their classrooms.[17] The qualitative data reveal a matching internal shift. Teachers were no longer just implementing strategies. They were embodying a new professional identity, and their language changed: they began to call themselves "guides," "facilitators" and "partners in learning." This identity shift is the hallmark of true professional development, and it is consistent with the continued rise in self-efficacy scores in the latter half of the study (0.87 points, 39% of the total gain). Confidence no longer rested on classroom control. It rested on the ability to spark curiosity, facilitate discovery and manage the "good noise" of an engaged classroom.[23] The move from transmitter of facts to facilitator of meaning is central to building a profession from the ground up. It is slow, arduous and deeply personal, and a one-off workshop or short-term evaluation is unlikely to capture it.

### *4.2 Professional learning communities and cultural responsiveness*

Cognitive dissonance and supported experimentation were the sparks. The Professional Learning Communities were the social engine that kept the fire burning for three years. In the interviews, journals and focus groups, PLCs were described as among the most valued components of the intervention for sustaining change over time. To see why, one must first appreciate the professional isolation that defined teachers' lives at baseline. In the semi-rural and remote highland schools especially, teachers were islands. They planned alone, taught alone and solved problems alone. Isolation breeds conservatism. Without a chance to see alternative practices or discuss challenges with peers, teachers have little choice but to cling to the methods they know, whatever their effectiveness.[12]

Bi-weekly, structured PLC meetings rewired the social architecture of the schools. Mr. A's story about the "failed" group activity illustrates how PLCs created a space for professional vulnerability. Failure met with shared laughter and similar stories of struggle, not judgment, was the moment the PLC turned from an administrative requirement into a genuine community of practice.[10] That safety to be imperfect was the bedrock for every other PLC function.

PLCs also functioned as powerful incubators of innovation. The qualitative data are full of examples of PLCs acting as micro research and development labs. A teacher would learn a technique in coaching, try it and bring the results, good or bad, back to the group. The PLC would dissect the experience, refine the strategy and co-plan how others could adapt it to their classrooms. This collaborative inquiry democratized innovation. A good idea from one teacher no longer stayed in that teacher's classroom. It became part of the collective professional capital of the whole school. The process probably contributed to the steady improvement in COP scores, as successful, peer-vetted strategies spread organically through the staff. Locally relevant materials, such as local woven bag patterns used to teach geometry, were almost always born in these collective brainstorming sessions.

Beyond this practical function, PLCs were a vital source of emotional and motivational sustenance. Teaching is emotionally taxing, and resource-scarce environments amplify the

strain. Mrs. A's reflection shows how constant the temptation to revert to easier, familiar methods was.[24] PLCs acted as a powerful counterweight. They were a source of regular "spiritual recharging," where teachers were reminded of their shared purpose and bolstered by colleagues' successes and solidarity. This social-emotional support is an underestimated part of teacher retention and resilience. By combating burnout and sustaining motivation, PLCs appear to have helped keep teachers engaged in the difficult work of professional change over the long haul, a factor reflected in the sustained growth in their self-efficacy.[12,23]

Finally, PLCs began to change the culture of the schools themselves. Traditionally, practice was privatized and each classroom was a sovereign kingdom. PLCs dissolved those boundaries. As teachers collaboratively analyzed student work across grade levels, they came to see student learning as a shared, school-wide responsibility. The shift from "my students" to "our students" is one of the most profound cultural changes a school can undergo. It lays the foundation for a culture of continuous improvement that depends on no single project or external coach and is embedded instead in the daily interactions of staff. This is the ultimate goal of sustainable TPD: to build the internal capacity of a school to lead its own improvement. Large-sample evidence likewise links well-functioning PLCs to student achievement through collective teacher efficacy and cognitively activating teaching.[25]

The third major finding concerns the teachers' journey toward becoming culturally responsive practitioners, a process we have termed "Navigating the Cultural Interface." It was perhaps the most complex and nuanced part of their transformation. Teachers had to do more than change techniques. They had to challenge deeply held assumptions about the nature of knowledge and the purpose of schooling.

At baseline, teachers worked within a rigid dichotomy, as Mrs. M described it: the world of formal school knowledge (ilmu) and the world of local village life (adat). The two worlds were seen as separate and unequal. Ilmu was modern, official and legitimized by the national curriculum and examinations. Adat was traditional, informal and belonged outside the classroom walls. The belief created a profound disconnect for Papuan students, whose lived realities, languages and identities were implicitly devalued the moment they entered the schoolhouse.[2] Low student engagement was a predictable result of this cultural schism.

The TPD program deliberately challenged the dichotomy. It framed culturally responsive pedagogy as a core principle of effective teaching and not as a folkloric add-on.[13] Initial resistance, the feeling that bringing adat into the classroom was "breaking a rule," was a significant hurdle. Overcoming it took extensive dialogue and the explicit permission and encouragement of coaches and facilitators. The breakthrough came when teachers began to see cultural relevance as a powerful bridge to the formal curriculum rather than a dilution of it. Reports from other settings are consistent with this experience: sustained professional development shifted teachers from deficit-based to assets-based views of culturally diverse learners,[15] structured reflection and goal setting have been reported to support culturally responsive practice among in-service teachers,[26] and community-based, culturally grounded science teaching in Indigenous Papuan border schools was followed by gains in students' scientific literacy.[14]

Mr. P's story of teaching multiplication with sweet potatoes is a vivid illustration of the principle in action. The learning objective, understanding multiplication, came straight from the national curriculum. By grounding the abstract concept in a tangible, culturally significant context (the distribution of a staple food among families in a hamlet), he transformed the lesson. An abstract exercise in symbol manipulation became a meaningful problem to solve. The "good noise" that erupted in his classroom was the sound of authentic engagement, of students using cultural knowledge as a resource to reach academic knowledge. The lesson was no longer just about math. It was about their lives, and it affirmed that their world and the world of school could coexist and enrich one another.

The journey was not simple, and the qualitative data revealed numerous challenges. Teachers struggled to find resources and information.[27] They had to become amateur ethnographers and historians, talking to village elders to collect stories and learning local classification systems for plants and animals. Some faced pushback from parents who had internalized the ilmu/adat dichotomy and worried that a focus on local culture would disadvantage their children in national exams. Teachers learned to navigate this by becoming advocates. They explained that these methods did not replace the curriculum but made it more accessible, and they pointed to their children's newfound excitement for learning as the ultimate proof of the methods' value.

By the end of the three years, the teachers who were most successful in this domain had become skilled cultural brokers and curriculum designers. They learned to see the national curriculum as a set of goals reachable by multiple pathways, not as a rigid script. They grew adept at "weaving," lacing the threads of local knowledge and official curriculum into a stronger, more beautiful and more meaningful educational tapestry for their students. This advanced pedagogical skill, reflected in the COP scores, represented the pinnacle of their professional growth and showed a deep understanding of both students and craft. It was a clear demonstration that building a profession in a place like Papua requires profound cultural wisdom as well as pedagogical skill.

### *4.3 Limitations*

Several limitations should be noted. There was no control or comparison group, so maturation, repeated testing, familiarity with the instruments and the added attention of taking part cannot be separated from the effect of the program, and the results must be read as associations observed within a single cohort. The measures were partly self-reported, the sample was 50 teachers who agreed to take part from schools run by one foundation, and the intervals between measurement points were unequal (about 12 months from T1 to T2 and about 22 months from T2 to T3). The intervention was also intensive and well resourced, which presents challenges for scalability,[16] and the average effects of TPD on student achievement are small and vary widely across programs,[9] so the large gains reported here should not be assumed to transfer to other settings. Teachers were followed only to the end of the program, so lasting effects were not examined. Elsewhere, gains made during a program have faded afterward,[28] and reviews of TPD in Indonesia stress that ongoing, systemic support is needed for gains to last.[5] The deep, transformative change within this cohort nevertheless provides a detailed account of what sustained, collaborative development can look like, and it can be tested in comparative designs.

## 5. Conclusion

This longitudinal study set out to chart the professional growth of a group of dedicated but isolated private school teachers in Papua. Over three years, a powerful and inspiring story of transformation unfolded. The findings are supported by quantitative and qualitative evidence from this cohort. Change is possible. Over three years it was large, and it came when professional development was approached as a long-term investment in human potential rather than as a short-term logistical exercise.

We saw teachers move beyond the simple transmission of facts to become true facilitators of learning. This "pedagogical awakening" reshaped their professional identity from the inside out. We witnessed the "power of the collective," in which

professional learning communities served as a social engine that turned isolation into collaboration, vulnerability into strength and individual effort into a shared school culture of improvement. And we explored the nuanced work of "navigating the cultural interface." Teachers became skilled weavers of knowledge. Their tapestry honors the world of the child as much as the demands of the curriculum.

The story of these 50 teachers is more than a successful case study. It offers a promising, evidence-informed model for building a profession from the ground up. Excellence begins with the disruptive spark of new ideas. Coaching paves the way through supportive practice. The collaborative spirit of a professional community then sustains the effort, mile after mile, over the long road. The most powerful resource in any classroom is neither the textbook nor the technology. It is the teacher: mind, heart and collaborative spirit. Invest in teachers with patience, respect and belief in their capacity to grow, and we may unlock the potential for a more engaging, equitable and affirming education for all children, especially those on the furthest margins.

## Declaration

### *Artificial Intelligence Use*

The authors did not use generative artificial intelligence or AI-assisted tools to write, edit, or analyze any part of this work. The authors reviewed all content and take full responsibility for it.

### *Author Contributions*

Conceptualization, I.S. and A.G.; Methodology, I.S., A.G. and M.H.; Investigation, I.S., A.E.-H., G.P. and E.W.; Data curation, G.P. and A.H.; Formal analysis, I.S. and M.H.; Writing – original draft, I.S.; Writing – review & editing, A.G., A.E.-H., G.P., E.W., A.H. and M.H.; Supervision, I.S.; Project administration, I.S. All authors have read and agreed to the final version of the manuscript.

### *Funding*

This study received no funding from any public, commercial, or not-for-profit agency, and no funder had any role in its design, analysis, or reporting.

### *Conflict of Interest*

The authors declare no competing financial or non-financial interests related to this work.

### *Ethics Approval and Consent*

Written informed consent was obtained from all participating teachers, who were assured of confidentiality, anonymity and the right to withdraw. Pseudonyms are used for all individuals and schools. The study protocol was approved by Ethical Committee of Social Research, Enigma Institute, Indonesia (Approval number 2021/192).

### *Consent for Publication*

All participants gave written informed consent, and no identifiable personal information is reported; names of individuals and schools are pseudonyms.

### *Data Availability*

The datasets generated and analyzed during this study can be obtained from the corresponding author on reasonable request.

### *Acknowledgments*

None.

## References

1. Gershenson S. Linking teacher quality, student attendance, and student achievement. Educ Finance Policy. 2016;11(2):125-149. doi:10.1162/edfp_a_00180
2. Marpaung RW, Sinaga SB, Womsiwor S. Inclusive education curriculum development for indigenous students in Papua. SHS Web Conf. 2022;149:01023. doi:10.1051/shsconf/202214901023
3. Rahman A. Investigating school conditions for teachers' professional learning and development in Indonesia. Teach Dev. 2022;26(2):240-262. doi:10.1080/13664530.2022.2034662
4. Rahman A. High participation, low impact: the challenge for teacher professional development in Indonesia. Int J Pedagogy Teach Educ. 2021;5(1):1. doi:10.20961/ijpte.v5i1.46636
5. Rahmi I, Rassanjani S. Enhancing teacher quality in Indonesia: the impact of teacher professional development on achieving sustainable development goal 4.c. Soc Sci Humanit Open. 2025;12:102123. doi:10.1016/j.ssaho.2025.102123
6. Kennedy MM. How does professional development improve teaching? Rev Educ Res. 2016;86(4):945-980. doi:10.3102/0034654315626800
7. Sims S, Fletcher-Wood H. Identifying the characteristics of effective teacher professional development: a critical review. Sch Eff Sch Improv. 2021;32(1):47-63. doi:10.1080/09243453.2020.1772841
8. Kraft MA, Blazar D, Hogan D. The effect of teacher coaching on instruction and achievement: a meta-analysis of the causal evidence. Rev Educ Res. 2018;88(4):547-588. doi:10.3102/0034654318759268
9. Visscher AJ, Dmoshinskaia N, Pellegrini M, Rey-Naizaque A. (When) do teacher professional development interventions improve student achievement? A meta-analysis of 128 high-quality studies. Educ Res Rev. 2025;49:100742. doi:10.1016/j.edurev.2025.100742
10. Vangrieken K, Meredith C, Packer T, et al. Teacher communities as a context for professional development: a systematic review. Teach Teach Educ. 2017;61:47-59. doi:10.1016/j.tate.2016.10.001
11. Svendsen B. Teachers' experience from a school-based collaborative teacher professional development programme: reported impact on professional development. Teach Dev. 2016;20(3):313-328. doi:10.1080/13664530.2016.1149512
12. Abdullah Z, Jibson Anthony V, Mohd Zabidi Z, Kenayathulla HB. The mediating role of teacher self-efficacy in relationship between professional learning community and collective teacher efficacy in Sarawak primary schools, Malaysia. Environ Soc Psychol. 2025;10(4). doi:10.59429/esp.v10i4.3522
13. Aronson B, Laughter J. The theory and practice of culturally relevant education: a synthesis of research across content areas. Rev Educ Res. 2016;86(1):163-206. doi:10.3102/0034654315582066
14. Ali A, Kadir A, Ristiani R. Culturally responsive community-based inquiry to enhance basic scientific literacy in Indigenous Papua border elementary schools. Ta'dib. 2025;28(2):285-296. doi:10.31958/jt.v28i2.15908
15. Uribe-Zarain X, Hellman AB, Bell AB. Transforming teacher attitudes and practices: the efficacy of sustained professional development in culturally responsive education. TESOL J. 2025;16(1):e896. doi:10.1002/tesj.896
16. Soebari T, Aldridge JM. Investigating the differential effectiveness of a teacher professional development programme for rural and urban classrooms in Indonesia. Teach Dev. 2016;20(5):701-722. doi:10.1080/13664530.2016.1185031
17. Rodgers A, Abdulrahman T. Impact of online teacher professional development programs on classroom teaching practice in Indonesia. Innov Teach Learn. 2025;7(2):69-97. doi:10.4208/itl.20250205
18. Allen W, Hyde M, Whannel R, et al. Teacher reform in Indonesia: can offshore programs create lasting pedagogical shift? Asia Pac J Teach Educ. 2018;46(1):22-37. doi:10.1080/1359866X.2017.1355051
19. Tschannen-Moran M, Hoy AW. Teacher efficacy: capturing an elusive construct. Teach Teach Educ. 2001;17(7):783-805. doi:10.1016/S0742-051X(01)00036-1
20. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77-101. doi:10.1191/1478088706qp063oa
21. Kit PL, Ow Yeong WME, Chen M. Changing professional identities: a qualitative study of how Singapore allied educators managed their own resistance to change. Teach Dev. 2025;29(3):575-592. doi:10.1080/13664530.2024.2393330
22. Lynch K, Gonzalez K, Hill H, Merritt R. A meta-analysis of the experimental evidence linking mathematics and science professional development interventions to teacher knowledge, classroom instruction, and student achievement. AERA Open.

2025;11:23328584251335302. doi:10.1177/23328584251335302

23. Zee M, Koomen HMY. Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: a synthesis of 40 years of research. Rev Educ Res. 2016;86(4):981-1015. doi:10.3102/0034654315626801
24. Castro Mosqueda H. The role of emotions in teacher agency: a study of Mexican English language educators. Profile Issues Teach Prof Dev. 2025;27(1):67-82. doi:10.15446/profile.v27n1.114867
25. Liu S, Yin H. Opening the black box: how professional learning communities, collective teacher efficacy, and cognitive activation affect students' mathematics achievement in schools. Teach Teach Educ. 2024;139:104443. doi:10.1016/j.tate.2023.104443
26. Nganga L, Nydam A, Kambutu J. Goal setting for teacher development: enhancing culturally responsive, inclusive, and social justice pedagogy. Educ Sci. 2025;15(3):264. doi:10.3390/educsci15030264
27. Nawab A, Bissaker K. Contextual factors influencing the effectiveness of professional development for teachers in rural Pakistan. Teach Dev. 2021;25(5):706-727. doi:10.1080/13664530.2021.1974080
28. Wolf S, Peele ME. Examining sustained impacts of two teacher professional development programs on professional well-being and classroom practices. Teach Teach Educ. 2019;86:102873. doi:10.1016/j.tate.2019.07.003