

Strengthening the literacy and numeracy culture among Madurese language teachers through the Pakem Maddhu community empowerment program

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Abstract

Madurese language education faces two major challenges: declining intergenerational language transmission and limited integration of literacy and numeracy into classroom practice. A preliminary needs assessment in three partner schools in Pamekasan Regency identified low teacher competency, limited contextual teaching resources, weak student engagement, and minimal utilization of local cultural assets in learning. To address these challenges, this community engagement program adopted a Participatory Action Research (PAR) approach involving 20 Madurese language teachers, school leaders, researchers, and the Pakem Maddhu community. The program was conducted through four interactive cycles: (1) participatory problem identification and asset mapping; (2) collaborative planning and capacity building; (3) classroom implementation with mentoring and observation; and (4) reflective evaluation to improve teaching practices and learning resources. Local cultural assets, including *paribasan*, *pantun*, *tembang macapat*, and Madurese batik motifs, were integrated into literacy- and numeracy-based learning activities. Program evaluation, using competency tests, questionnaires, classroom observations, and reflective discussions, demonstrated substantial improvements in teacher competency (52.0 to 78.3; $p < .001$), increased teacher confidence in using digital learning media (85%), and higher student interest in Madurese language learning (38.6% to 72.4%; $p = .004$). Beyond improving instructional competence, the program strengthened collaboration among teachers, schools, and the local community, resulting in contextual teaching modules, lesson plans, digital learning resources, and a sustainable professional learning network. The program contributes a replicable, community-based empowerment model that integrates Participatory Action Research, local cultural assets, literacy and numeracy integration, and teacher professional development for regional language education.

Keywords

community empowerment; literacy culture; local culture; Madurese language teachers; participatory action research

Abstrak

Pembelajaran bahasa daerah Madura menghadapi dua tantangan utama yaitu menurunnya pewarisan bahasa antargenerasi serta rendahnya integrasi literasi dan numerasi dalam pembelajaran di kelas. Hasil analisis kebutuhan pada tiga sekolah mitra di Kabupaten Pamekasan menunjukkan rendahnya kompetensi guru, terbatasnya bahan ajar kontekstual, rendahnya minat belajar peserta didik serta belum optimalnya pemanfaatan aset budaya lokal sebagai sumber belajar. Untuk menjawab permasalahan tersebut program pengabdian kepada masyarakat ini menerapkan pendekatan Participatory Action Research (PAR) yang melibatkan 20 guru bahasa Madura kepala sekolah, tim pengabdian dan komunitas Pakem Maddhu sebagai mitra kolaboratif. Program dilaksanakan melalui tiga siklus, yaitu identifikasi masalah dan pemetaan aset secara partisipatif, perencanaan bersama dan

penguatan kapasitas guru, serta implementasi pembelajaran yang disertai pendampingan, observasi, dan refleksi untuk penyempurnaan praktik pembelajaran. Berbagai aset budaya lokal, seperti paribasan, pantun, tembang macapat, dan motif batik Madura, diintegrasikan kedalam kegiatan pembelajaran literasi dan numerasi. Evaluasi program melalui tes kompetensi, angket, observasi kelas, dan diskusi reflektif menunjukkan peningkatan kompetensi guru dari 52,0 menjadi 78,3 ($p < 0,001$), meningkatnya kepercayaan diri guru dalam memanfaatkan media pembelajaran digital hingga 85%, serta kenaikan minat belajar peserta didik dari 38,6% menjadi 72,4% ($p = 0,004$). Selain meningkatkan kompetensi pembelajaran, program ini memperkuat kolaborasi antara sekolah, komunitas, dan perguruan tinggi menghasilkan modul ajar kontekstual, perangkat pembelajaran, sumber belajar digital, serta jejaring belajar profesional yang berkelanjutan. Program ini menghasilkan model pemberdayaan berbasis komunitas yang mengintegrasikan pendekatan PAR, aset budaya lokal, literasi dan numerasi, serta pengembangan profesional guru yang dapat direplikasi pada pembelajaran bahasa daerah di berbagai wilayah.

Kata Kunci

budaya literasi; budaya lokal; guru bahasa Madura; pemberdayaan komunitas; penelitian tindakan partisipatif

1. Introduction

The twenty-first century has elevated literacy and numeracy from basic school competencies to foundational dispositions for democratic participation, critical citizenship, and economic agency (Geiger et al., 2023). Literacy encompasses the situated capacity to read, interpret, and produce text in culturally meaningful ways, while numeracy denotes the application of mathematical reasoning to authentic problems (OECD, 2023). In Indonesia, the PISA 2022 results revealed that only 18% of 15-year-olds reached at least Level 2 in mathematics, well below the OECD average of 69%, while reading and mathematics scores (359 and 366) remained markedly below international means (476 and 472) (OECD, 2023). These figures underscore the urgency of locally grounded educational interventions. Beyond improving academic achievement, strengthening literacy and numeracy requires contextual approaches that are responsive to learners' linguistic, cultural, and social environments, particularly in regions where local languages remain an important medium of cultural identity.

For Madura, this national challenge intersects with the gradual erosion of the Madurese language as a medium of intergenerational transmission (Wibowo & Wahyudi, 2022). Although Madurese continues to be taught as local content in schools, classroom practices remain largely textbook-oriented and insufficiently connected to students' everyday cultural experiences. Consequently, opportunities to integrate literacy, numeracy, and local cultural knowledge are rarely explored. A pre-program needs assessment conducted through classroom observations, focus group discussions with school principals and teachers, and baseline competency tests across three partner schools (SDN Panglegur 2; MTs Nurul Huda and MTs Al-Islamiyah) identified four interconnected problems. First, teachers demonstrated limited competency in integrating literacy and numeracy into Madurese-language instruction, with an average score of only 52.0 out of 100. Second, student interest in Madurese language learning was relatively low (38.6 %), reflecting limited engagement with existing learning approaches. Third, none of the participating schools possessed locally developed teaching modules or contextual instructional resources based on Madurese cultural heritage. Finally, teachers reported that numeracy was generally perceived as the exclusive responsibility of mathematics teachers, limiting interdisciplinary collaboration and innovation in language classrooms. These findings collectively indicate that the challenge extends beyond pedagogical competence to include curriculum resources, teacher collaboration, and the utilization of local cultural assets.

Addressing these complex challenges requires an approach that does not merely transfer pedagogical knowledge from universities to schools but actively involves teachers and local communities in identifying problems, designing solutions, implementing innovations, and reflecting on their practices. Accordingly, this community engagement program adopted a

Participatory Action Research (PAR) approach, in which teachers, school leaders, researchers, and members of the Pakem Maddhu community collaboratively became cocreators of educational change rather than passive recipients of training. Within this participatory framework, local cultural resources—including *paribasan* (proverbs), *pantun*, *tembang macapat*, traditional stories, and Madurese batik motifs—were recognized not only as cultural heritage but also as pedagogical resources for strengthening literacy and numeracy learning.

This program is anchored in four interrelated bodies of theory that reframe teacher professional development as a community-driven, asset-based process rather than as the transfer of expertise from external experts to passive recipients. Empowerment theory (Zimmerman, 1995; Perkins & Zimmerman, 1995) conceptualizes empowerment as a multilevel process operating across intrapersonal (self-efficacy and control beliefs), interactional (critical awareness of resources), and behavioral (collective action) domains. For teachers, empowerment means moving from being objects of training policy to active agents shaping their own professional learning.

Asset-Based Community Development (ABCD) (Mathie & Cunningham, 2003; Kretzmann & McKnight, 1993) reframes communities not as bundles of deficits to be repaired but as repositories of cultural, social, and human capital. Rather than replacing the problem identification stage, PAR ABCD complements it by enabling participants to identify existing strengths that can be mobilized to address locally identified challenges. Applied to Madura, ABCD highlights *paribasan*, *pantun*, *tembang macapat*, batik motifs, local storytellers, and the Pakem Maddhu community itself as valuable educational assets that can support culturally responsive literacy and numeracy instruction.

Community-Based Participatory Research (CBPR) (Wallerstein & Duran, 2010; Israel et al., 2019) is an orientation in which researchers, practitioners, and community members co-define problems, co-design interventions, and co-interpret findings. CBPR aligns conceptually with the Participatory Action Research design adopted in this program (Cockerham, 2024), ensuring that each intervention cycle emerged from collaboratively identified needs rather than externally prescribed agendas. Consequently, the asset-mapping activities undertaken in this program formed part of the participatory diagnosis stage rather than constituting an independent methodological approach.

Communities of Practice (CoP) (Wenger, 1998; Gonçalves et al., 2022) explain how shared domain, mutual engagement, and a joint repertoire of resources generate situated learning. The Pakem Maddhu community functioned as such a CoP providing the relational architecture through which teacher empowerment, collaborative reflection, and continuous professional learning were sustained beyond the formal training sessions. This sustained interaction enabled participants to transform individual learning into collective professional practice.

Despite a growing body of work on contextual learning and ethnomathematics in Indonesia (Ningrum et al., 2022; Sunzuma & Umbara, 2025), three gaps remain. First, (Revina et al., 2023) documented that mainstream teacher professional development in Indonesia remains predominantly top-down, generic, and disconnected from classroom realities, resulting in limited long-term impact. Second, existing ethnomathematics studies have primarily focused on mathematics education, with relatively few integrating language learning and numeracy within a unified pedagogical framework (Sunzuma & Umbara, 2025). Third, although community engagement initiatives are increasingly common, studies explicitly combining Participatory Action Research, Empowerment Theory, Asset-Based Community Development, and Communities of Practice within regional-language teacher education remain scarce, particularly outside Java. These gaps suggest the need for a community engagement model that not only empowers teachers but also mobilizes local cultural assets through participatory collaboration to strengthen literacy and numeracy learning.

In response this community engagement program pursued three specific objectives: (a) to empower Madurese language teachers in Pamekasan Regency to integrate literacy and numeracy through a culturally grounded, participatory, and asset-based approach; (b) to coproduce contextual teaching modules, lesson plans, assessment instruments, and digital learning resources together with the Pakem Maddhu community; and (c) to evaluate both

quantitatively and qualitatively the program's contribution to teacher competency, self-efficacy, collaborative practice and student learning interest, thereby demonstrating how Participatory Action Research can operationalise empowerment theory within regional language education.

2. Methods

The program adopted a Participatory Action Research (PAR) design following the iterative plan–act–observe–reflect cycle (Cockerham, 2024). In line with PAR principles, the program was initiated through a participatory diagnosis of community needs, followed by collaborative action planning, implementation, observation, and reflective evaluation. The intervention was implemented over six weeks, from October to November 2025, in Pamekasan Regency, Madura. Three partner schools were purposively selected because they demonstrated low baseline literacy and numeracy performance and expressed a commitment to strengthening local content education: SDN Panglegur 2 (elementary school), MTs Nurul Huda, and MTs Al-Islamiyah (junior secondary school). Ethical approval was obtained from the UIN Madura Ethics Committee No. B-045/KEP-UINM/X/2025), and the program was registered with the Pamekasan Regency Education Office.

Participants consisted of three stakeholder groups: (a) twenty Madurese language teachers ($M_{age} = 38.6$ years, $SD = 8.4$; 12 female and 8 male) with an average teaching experience of 11.2 years; (b) 145 students from Grades V–IX who participated in the evaluation of learning interest; and (c) seven facilitators representing the Pakem Maddhu community and the UIN Madura community engagement team. School principals were actively involved as institutional partners throughout the planning and reflection stages. Written informed consent was obtained from all adult participants, while parental consent was secured for student participation.

The PAR process consisted of three iterative cycles integrating problem identification, collaborative action, observation, and reflection. The activities implemented in each cycle are summarised in Table 1.

Table 1. Activities implemented in each cycle

PAR Cycle	Main Activities	Participants	Outputs
Cycle 1 (Weeks 1–2) Participatory Problem Identification and Collaborative Planning	Classroom observations, baseline competency assessment, document review, Focus Group Discussions (FGDs), identification of instructional problems, and Asset-Based Community Development (ABCD) mapping of local educational assets (<i>paribasan</i> , <i>pantun</i> , <i>tembang macapat</i> , folktales, batik motifs, and community cultural practitioners). The identified problems and available assets were collaboratively used to formulate the intervention plan.	Teachers, school principals, Pakem Maddhu community, researchers	Priority problems identified, community asset map, collaboratively designed training curriculum, and action plan
Cycle 2 (Weeks 3–5) Collaborative Action and Classroom Implementation	Capacity-building workshops covering literacy, numeracy integration, contextual lesson planning, digital learning media, and assessment design; classroom implementation; peer mentoring; facilitator assistance; weekly online consultation; and structured classroom observations.	Teachers, facilitators, researchers	Contextual lesson plans, teaching modules, digital learning media, classroom implementation records, observation notes
Cycle 3 (Week 6) Observation,	Reflective workshops, presentation of classroom	Teachers, school	Revised teaching modules, assessment

Reflection, and Program Refinement	practices, collaborative analysis of implementation results, revision of teaching materials, evaluation of program outcomes, and dissemination planning.	principals, researchers, Pakem Maddhu community	instruments, digital learning resources, recommendations, dissemination materials, and a strengthened professional learning community
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Four instruments were used to capture process and outcome data. Each instrument was mapped to specific empowerment indicators derived from Zimmerman (1995):

Table 2. Instruments, Empowerment Indicators, and Statistical Treatment

Instrument	Empowerment Domain (Zimmerman, 1995)	Reliability / Validation	Statistical Procedure
Pre–post competency test (25 items, MC + short answer)	Behavioral (acquired competencies)	Cronbach's $\alpha = .82$; piloted with 5 non-participating teachers; expert review by 2 senior Madurese language teachers	Paired-samples t-test; Cohen's d; Hake's g
Teacher self-efficacy questionnaire (15 items, 5-point Likert)	Intrapersonal (perceived competence and control)	Adapted from Tschannen-Moran & Hoy (2001); content validity reviewed by an expert in educational measurement	Descriptive statistics; percentage agreement
Student interest questionnaire (15 items, 5-point Likert)	Outcome (perceived empowerment effect on learners)	Cronbach's $\alpha = .79$; N = 145; expert review and pilot	Wilcoxon signed-rank test (school-level)
Structured classroom observation sheet (rubric, 6 dimensions)	Interactional (community-mediated practice)	Inter-rater agreement $\kappa = .76$ between two observers across 12 visits	Qualitative coding (Miles, Huberman & Saldaña, 2014)

Note. MC = multiple choice; PLC = professional learning community.

Pre–and post-competency scores were tested for normality using the Shapiro–Wilk; because the assumption held, paired-samples t-tests were used. Effect sizes were computed with Cohen's d, and gain scores were classified using Hake's (1998) normalized gain: $g \geq 0.7$ (very high), $0.3 \leq g < 0.7$ (high), and $g < 0.3$ (low). Student interest changes were analyzed at the school level using Wilcoxon signed-rank tests because of the small number of schools. Qualitative data from observations, FGD transcripts, and reflective journals were analyzed interactively using the (Miles, Huberman, and Saldaña, 2014) framework, with data, source, and method triangulation to establish credibility (Lincoln & Guba, 1985). All analyses were conducted in JASP 0.18.

The program concluded with a regional dissemination seminar co-hosted with the Madurese-Language MGMP (Musyawarah Guru Mata Pelajaran) and the Pamekasan Regency Education Office. Outputs were deposited in the Pakem Maddhu digital repository to enable replication.

3. Result and Discussion

3.1 Conceptual Framework of Pakem Maddhu Empowerment

Before presenting the empirical findings, Figure 1 illustrates the conceptual architecture of the Pakem Maddhu Community Empowerment Model developed through this community engagement program. Unlike conventional teacher training that typically begins with predetermined instructional content, the present model positions participatory problem identification as the starting point of the empowerment process. As shown in Figure 1, the model follows three iterative Participatory Action Research (PAR) cycles: participatory diagnosis and community asset mapping; collaborative planning and capacity building;

classroom implementation accompanied by observation and mentoring; and collective reflection for continuous improvement.

The framework integrates four complementary theoretical perspectives. Empowerment Theory explains the development of teachers' intrapersonal, interactional, and behavioral capacities; Asset-Based Community Development (ABCD) guides the identification and mobilization of local cultural resources; Community-Based Participatory Research (CBPR) ensures that teacher and community members jointly define problems and design solutions. At the same time, Communities of Practice (CoPs) sustain professional learning beyond formal interventions. Consequently, the model links community assets with collaborative action, resulting not only in improved teacher competency but also in sustainable partnerships among schools, universities, and the Pakem Maddhu community.

The subsequent sections interpret the program outcomes in light of this conceptual framework, demonstrating how each PAR cycle contributed to teacher empowerment, student engagement, and community capacity-building.

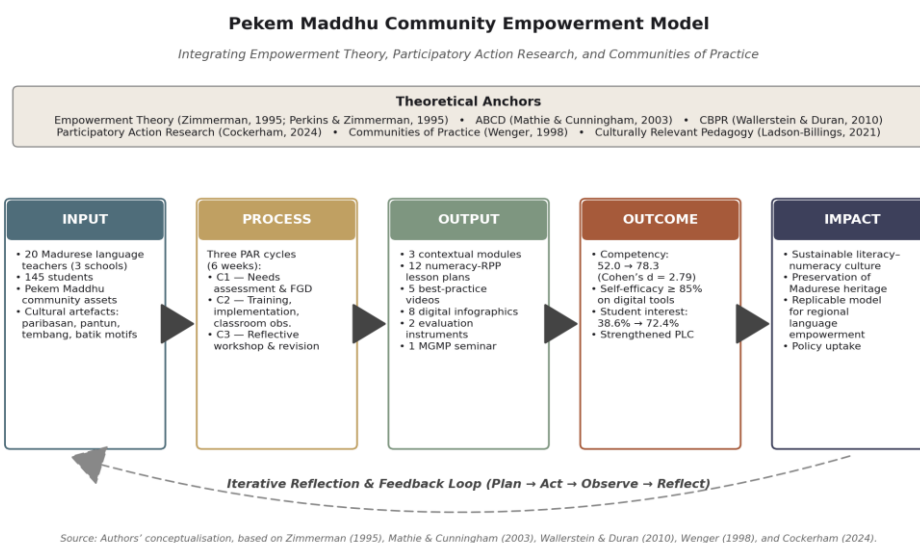


Figure 1. Conceptual framework of the Pakem Maddhu Community Empowerment Model.

3.2 Teacher Competency Gains and the Empowerment Mechanism

As illustrated in Figure 1, the improvement in teacher competency did not result solely from workshop participation but from the iterative PAR process in which teachers repeatedly identified instructional problems, implemented collaboratively designed solutions, observed classroom practices, and reflected on their experiences. This cyclical process transformed teachers from recipients of training into co-designers of pedagogical innovation.

Table 2 presents pre-test and post-test scores across the five competency aspects targeted by the program.

Table 2. Pre-Test and Post-Test Scores of Teacher Competency in Literacy and Numeracy Integration

Competency Aspect	Pre-Test M	Post-Test M	Gain	Category
Literacy-based lesson plan design	52.4	79.2	+26.8	High
Numeracy integration in Madurese learning	48.6	74.8	+26.2	High
Contextual teaching material development	55.2	80.4	+25.2	High
Digital media utilisation for local content	45.8	76.2	+30.4	Very High
Assessment design for literacy-numeracy	58.0	81.0	+23.0	High
Overall Average	52.0	78.3	+26.3	High

Note. N = 20 teachers; data collected October–November 2025; paired-samples $t(19) = 12.47$, $p < .001$, Cohen's $d = 2.79$.

The overall gain of 26.3 points ($d = 2.79$) substantially exceeds the effect sizes typically reported for centralized teacher professional development in Indonesia, which Revina et al. (2023) characterize as producing small, short-lived changes in classroom practice. Three mechanisms grounded in our theoretical framework help explain this gap. First, in line with Zimmerman's (1995) intrapersonal component of empowerment, teachers reported a shift from passive recipients to co-designers, increasing their sense of perceived control. The largest gain (+30.4) occurred in digital media utilization, where teachers had reported the most baseline anxiety; this pattern is consistent with Bandura's (1997) self-efficacy theory, which predicts the steepest efficacy gains in domains where mastery experiences are most novel. Second, drawing on Mathie and Cunningham's (2003) ABCD logic, the training treated Madurese cultural artifacts not as decorative content but as primary epistemic resources, allowing teachers to mobilize existing tacit cultural knowledge rather than start from a deficit position. Third, the Pakem Maddhu community supplied the relational infrastructure described by Wenger (1998), enabling sustained mutual engagement beyond formal sessions.

The finding also demonstrates the importance of positioning community assets after participatory diagnosis. Rather than introducing externally designed teaching materials, teachers adapted locally available cultural resources identified collectively during Cycle 1. This participatory ownership is likely to explain why the observed effect size ($d = 2.79$) substantially exceeded those reported in conventional top-down professional development programs.

3.3 Teacher Self-Efficacy and Psychological Empowerment

Table 3. Teacher Self-Efficacy in Literacy and Numeracy Instruction (Post-Training Survey, $N = 20$)

Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
I can design literacy-based Madurese lesson plans	0	0	10	55	35
I can integrate numeracy in the Madurese language class	0	5	15	50	30
I feel confident using digital tools for local content	0	0	15	40	45
Community support helps my professional growth	0	0	5	35	60
The program is relevant to my daily teaching	0	0	5	45	50

Note. SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree.

The strongest agreement (95% Agree/Strongly Agree) emerged for the community-support and program-relevance items, providing empirical support for the interactional component of empowerment (Zimmerman, 1995) — that is, the perceived availability of the resources and social networks needed to act. This finding is congruent with Gonçalves et al. (2022), who showed that facilitator-mediated professional learning communities are pivotal for teacher empowerment, and with Wenger's (1998) thesis that learning is fundamentally relational. We acknowledge, however, that self-efficacy data are vulnerable to social-desirability bias given the close working relationship between participants and the facilitation team; the converging evidence from classroom observations and external student data partly mitigates this concern.

The high level of agreement regarding community support reflects more than positive perceptions toward the training. Within the PAR framework, teachers continuously interacted with peers, researchers, and members of the Pakem Maddhu community throughout the three implementation cycles. Such sustained collaboration created opportunities for reciprocal learning, peer feedback, and shared problem-solving, thereby strengthening teachers' professional confidence beyond individual capability. This finding reinforces Wenger's (1998) proposition that professional identity develops through participation in communities of practice rather than through isolated training events.

3.4 Student Interest and Culturally Relevant Pedagogy

From the perspective of Figure 1, increased student engagement represents the downstream outcome of the participatory empowerment process. Because teachers

collaboratively designed contextual learning activities based on students' own cultural environment, classroom instruction became more meaningful and authentic. Rather than functioning merely as cultural illustrations, *paribasan*, *tembang*, and batik motifs became vehicles for exploring literacy and numeracy concepts.

Table 4. Changes in Student Interest in Madurese Language Lessons (Pre and Post Program)

Partner School	N Students	Pre (%)	Post (%)	Gain (%)	Category
SDN Panglegur 2	45	38.0	72.0	+34.0	High
MTs Nurul Huda	52	42.5	76.8	+34.3	High
MTs Al-Islamiyah	48	35.2	68.5	+33.3	High
Average	145	38.6	72.4	+33.9	High

Note. School-level Wilcoxon signed-rank $Z = -2.89$, $p = .004$.

The 33.9 percentage-point average increase in student interest is consistent with Ladson-Billings (2021), whose culturally relevant pedagogy framework predicts heightened engagement when learners perceive academic content as continuous with their cultural identity. The largest absolute gain at MTs Al-Islamiyah (which began with the lowest baseline interest is particularly notable, suggesting that the program disproportionately benefited the most disengaged learners. We caution, however, that the absence of a control group means that student-level change cannot be cleanly attributed to the intervention rather than to teacher enthusiasm or general maturation. A component analysis in a future quasi-experimental study should disentangle these mechanisms.

3.5 Program Outputs and Collective Efficacy

Table 5. Summary of Program Output Products

No.	Output Type	Target	Achieved	Status
1	Contextual teaching module (Madurese literacy)	2	3	Exceeded target
2	Numeracy-integrated lesson plans (RPP)	10	12	Exceeded target
3	Best-practice videos (bilingual storytelling)	3	5	Exceeded target
4	Digital infographics on Madurese vocabulary	5	8	Exceeded target
5	Literacy–numeracy evaluation instruments	2	2	On target
6	Dissemination seminar with MGMP	1	1	On target (≥30 attendees)

Note. Program documentation, October–November 2025.

The outputs shown in Table 5 should therefore be interpreted not merely as products but as tangible evidence of community empowerment. In PAR, successful intervention is indicated not only by improved individual competencies but also by the community's capacity to generate and sustain locally relevant innovations independently. The production of additional teaching modules, lesson plans, and digital resources demonstrates that participants moved beyond meeting project requirements to collectively expand their professional repertoire.

Four of six outputs exceeded the original targets, with five best-practice videos produced against a target of three. This pattern of over-production is best understood through Bandura's (2000) construct of collective efficacy: a group's shared belief in its capability to organize and execute action increases the level of effort and persistence the group is willing to invest. In (Wenger's, 1998) terms, the over-production is evidence that a shared repertoire — an artifact-rich practice — was genuinely formed within the community.

Taken together, the findings position this program as a distinctive contribution to the community engagement literature on three fronts. First, while ethnomathematics studies in Indonesia have concentrated on mathematics classrooms (Sunzuma & Umbara, 2025), the present model demonstrates that ethnomathematical principles can be productively integrated into regional-language teacher education — using *paribasan*, *pantun*, and *tembang macapat*

as numeracy resources, and using batik motifs as geometric and pattern texts. Second, whereas Indonesian teacher professional development is dominated by centralized, deficit-oriented training (Revina et al., 2023), this program empirically demonstrates how an Asset-Based Community Development logic, operationalized through PAR, can yield large effect sizes and high participant ownership. Third, the model offers a portable architecture — the Pakem Maddhu CoP–PAR loop — that can be adapted to other Indonesian regional language contexts (Sundanese, Buginese, Balinese, etc.) and is consistent with recent calls for context-sensitive empowerment models (Aldrich & Meyer, 2015; Bowen et al., 2017).

Beyond individual teacher gains, the program produced ecosystem-level change. Schools embedded contextual learning practices into their local curricula; the Pamekasan Regency Education Office invited the team to advise on integrating literacy and numeracy modules into its local content policy; and the Pakem Maddhu community expanded its volunteer base. These developments echo those of Anderson-Butcher et al. (2022), who argue that lasting school improvement is produced not by isolated interventions but by genuine school–community partnerships (Romadhon et al., 2025).

Implementation surfaced three practical challenges. 1 baseline digital literacy varied widely, particularly among senior teachers. We addressed this through peer mentoring pairs. 2 training sessions had to be scheduled around teaching loads, prompting a mix of weekend sessions and asynchronous modules delivered via WhatsApp. 3 teachers initially viewed numeracy integration as outside their professional remit, but this view shifted as they identified numeric structures within *paribasan* and *tembang*.

Methodologically, four limitations should temper interpretation. First, the sample is small ($N = 20$ teachers, 145 students, 3 schools) and purposive, limiting generalizability. Second, the six-week duration precludes claims about long-term sustainability. Third, the absence of a control group means that maturation, testing, and Hawthorne effects cannot be fully excluded. Fourth, self-report measures are vulnerable to social desirability bias. Future work should adopt quasi-experimental designs with control sites, incorporate a longitudinal follow-up of at least 12 months, and include external classroom observation by raters unaffiliated with the program team.

4. Conclusion

This community engagement program demonstrates that Participatory Action Research (PAR), when integrated with Empowerment Theory, Asset-Based Community Development (ABCD), and Communities of Practice (CoP), offers an effective framework for empowering regional language teachers. The approach facilitated collaborative problem identification, local asset mobilization, collective action, and ongoing reflection. Implemented with 20 Madurese language teachers across three partner schools in Pamekasan Regency, the program strengthened teachers' competence in integrating literacy and numeracy, enhanced their confidence in using culturally responsive digital learning resources, and increased students' interest in Madurese language learning.

The principal contribution of this program is the development of the Pakem Maddhu Community Empowerment Model, which integrates participatory diagnosis, community asset mapping, collaborative capacity building, classroom-based action, reflective learning, and the consolidation of a professional learning community into a single, transferable framework for regional language teacher development. By positioning local cultural resources as educational assets rather than merely cultural artifacts, the model demonstrates how community engagement can simultaneously strengthen literacy and numeracy learning while supporting the preservation of regional languages and local cultural identity.

To sustain and expand these outcomes, stronger collaboration among the Pamekasan Regency Education Office, universities, MGMP networks, schools, and community organizations is essential to institutionalize the model within local-content curricula and ensure its ongoing development through professional learning communities. Future research should evaluate the model's long-term sustainability using quasi-experimental designs, control groups, and longitudinal follow-up across diverse regional-language contexts in Indonesia. Such investigations will provide more robust evidence regarding the durability, scalability, and

transferability of the Pakem Maddhu Community Empowerment Model as an approach to community-based educational development.

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