Teachers' Instructional Strategies in Addressing Learning Loss in Post-Pandemic Education

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Article Info :	Abstract
	This study investigates teachers' instructional strategies for addressing learning loss in post-pandemic secondary education through a qualitative descriptive multiple-site design. Data were collected via semi-structured interviews, non-participant classroom observations, and document analysis of lesson plans, assessment records, and remedial guidelines, enabling triangulation between teachers' rationales, enacted practices, and institutional expectations. Thematic analysis identified three interrelated strategy clusters shaping learning recovery. First, teachers employed diagnostic-driven instruction to map heterogeneous learning gaps and implement targeted remediation, strengthening precision in support allocation. Second, technology-enabled, blended, and adaptive instruction functioned as a recovery infrastructure that expanded differentiation, feedback cycles, and continuity of learning beyond classroom time. Third, sustainable recovery depended on professional collaboration, socio-emotional re-engagement, and family partnerships that rebuilt motivation, classroom stability, and shared responsibility for progress. Findings indicate that learning loss operates as a multidimensional challenge influenced by structural disparities and accountability pressures, requiring integrated pedagogical responses rather than isolated interventions. The study contributes evidence-based implications for recovery-oriented teaching and policy frameworks that support responsive instruction, teacher capacity building, and equitable post-pandemic learning restoration.

***Keywords :** Learning Loss, Instructional Strategies, Post-Pandemic Education, Blended Learning, Learning Recovery.*

INTRODUCTION

The post-pandemic education landscape has become a global testing ground for how school systems can restore learning trajectories that were disrupted at scale, with learning loss no longer framed as a temporary "shock" but as a durable structural problem that intersects with inequality, teacher capacity, and instructional design. Comparative evidence across regions has shown that learning disparities widened unevenly, not simply because of differential access to technology, but because the instructional conditions required for sustained learning continuity were fragmented across socioeconomic contexts and institutional readiness (Alejo et al., 2023). In parallel, the field has increasingly shifted from diagnosing learning loss toward examining how learning, assessment, and teacher professional development must be redesigned as a coherent ecosystem rather than treated as separate reforms, because post-pandemic recovery demands alignment between what is taught, how it is taught, and how learning is measured (Chen, 2023). Within this evolving global discourse, teachers have emerged as the primary mediators of recovery, positioned at the intersection of curricular demands, psychological reintegration of students, and the practical constraints of classroom time, yet the empirical mapping of which instructional strategies effectively address learning loss remains uneven and conceptually under-specified.

Prior studies have provided valuable but partial insights into teachers' responses, often revealing that instructional strategies in the post-pandemic era are shaped less by formal policy prescriptions than by teachers' beliefs, professional preparation, and the technological infrastructures available in schools. Research on teacher educators' attitudes has shown that the willingness to integrate technology-enabled

learning can persist beyond the pandemic, but such willingness does not automatically translate into pedagogically meaningful strategy selection, particularly when teachers are pressured to prioritize coverage over recovery (Adhya & Panda, 2022). Evidence from pre-service teachers' experiences similarly indicates that remote learning has altered professional identity and expectations, yet the translation of those experiences into classroom-level remediation practices remains inconsistent, especially when teacher education programs provide limited scaffolding for diagnosing learning gaps and tailoring instruction (Ali & Nath, 2023). Comparative reflections on teacher preparation across contexts further suggest that post-pandemic teacher readiness is not merely a function of technical skill, but of adaptive expertise—namely the capacity to redesign instruction responsively under uncertainty, which conventional training models have historically undervalued (Fletcher et al., 2022). Together, these strands imply that instructional strategies are embedded in broader professional ecologies, meaning that learning loss recovery cannot be reduced to a checklist of interventions.

Empirical work that explicitly targets learning loss recovery has tended to focus on discrete settings, subject domains, or programmatic interventions, producing a fragmented knowledge base that makes it difficult to generalize across contexts or infer mechanisms of impact. For example, literacy-focused strategies implemented in primary education settings demonstrate that targeted remediation and structured reading supports can accelerate recovery, yet such findings are often reported at the level of program description rather than as a theoretically grounded explanation of why particular instructional moves work under post-pandemic constraints (Anggraeni & Wicaksono, 2023). Research on summer learning loss has synthesized evidence that intensified instructional time and remediation can mitigate learning gaps, but it also highlights that effectiveness depends heavily on instructional quality and alignment with learners' needs, which are frequently assumed rather than systematically measured in post-pandemic studies (Gierczyk & Hornby, 2023). Studies in physical education further show that teachers' strategies in post-pandemic instruction are shaped by challenges in engagement, classroom management, and resource limitations, indicating that learning loss is not only cognitive but also behavioral and motivational, yet these insights are rarely integrated into broader instructional strategy frameworks (Culajara, 2024). This literature collectively signals that the field has identified many plausible strategies, but has not yet consolidated them into a coherent analytical model that captures how strategies function across different learning domains and institutional conditions.

A sharper reading of the literature reveals conceptual and empirical gaps that constrain the development of robust guidance for teachers and policymakers, particularly in the absence of clear differentiation between strategy adoption, strategy quality, and strategy effectiveness. Teachers' observations of post-pandemic learning loss have been framed through the lens of digital structural violence, suggesting that learning loss is partly produced by systemic inequalities embedded in digital infrastructures and institutional supports, yet this framing has not been sufficiently connected to the micro-level instructional decisions teachers make inside classrooms (Chiu, 2025). Much of the current evidence base relies on self-report descriptions of strategies or on localized case accounts, leaving unresolved whether certain strategies are effective because they directly remediate skill deficits, because they rebuild engagement and trust, or because they compensate for structural constraints that schools cannot otherwise address. At the same time, the post-pandemic discourse on elevating teacher talents positions teachers as agents of change and innovation, but it risks romanticizing teacher agency without empirically specifying which instructional practices represent scalable expertise rather than context-bound improvisation (Fránquiz et al., 2023). These limitations produce an analytical problem: the field has strong normative claims about what teachers should do, but comparatively weaker empirical clarity about what teachers actually do, under what conditions, and with what pedagogical logic.

The unresolved nature of these questions carries both scientific and practical urgency because learning loss recovery has become a long-term educational governance challenge rather than a short-term remedial project. If learning disparities are widening and persisting, then instructional strategies cannot be treated as interchangeable techniques; they must be understood as theoretically interpretable actions that operate through identifiable mechanisms, such as formative assessment, differentiated instruction, scaffolding, feedback cycles, and socio-emotional reintegration. The stakes extend beyond achievement scores, because post-pandemic schooling has intensified tensions between standardization and responsiveness, forcing teachers to negotiate between curriculum pacing and the ethical demand to meet students where they are. Without a clearer map of teachers' instructional strategies and the

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rationales guiding them, policy interventions risk producing performative compliance—teachers adopting surface-level remediation programs without the professional support needed to implement them with fidelity and adaptive depth. In this sense, the absence of an integrated understanding of instructional strategies is not merely a technical gap but a barrier to equitable recovery.

This study positions itself within the intersection of post-pandemic learning loss research, instructional strategy theory, and teacher professional practice by examining how teachers conceptualize, select, and enact instructional strategies aimed at addressing learning loss in post-pandemic education. It treats teachers' strategies not as isolated techniques but as situated pedagogical decisions shaped by learning diagnostics, classroom constraints, professional preparation, and perceived student needs. The study aims to contribute to the field by clarifying the typology and logic of instructional strategies used in recovery contexts, while also offering a methodological approach capable of capturing strategy patterns beyond anecdotal accounts. Specifically, the research seeks to (i) identify dominant instructional strategies teachers employ to address learning loss, (ii) analyze the pedagogical rationales and contextual drivers behind those strategies, and (iii) generate theoretical and methodological contributions by linking observed strategy patterns to an interpretive framework that can support future comparative studies and evidence-based professional development.

RESEARCH METHODS

This study employed an empirical approach, as it required direct evidence of teachers' instructional strategies enacted in real post-pandemic classroom contexts to address learning loss. The research adopted a qualitative descriptive design with a multiple-site approach to capture variations in instructional responses across settings. Participants consisted of teachers in secondary education who were actively teaching in the post-pandemic period and had been involved in learning recovery initiatives, selected through purposive sampling with criteria including a minimum of one academic year of post-pandemic teaching experience and responsibility for core instructional delivery. Data were collected using semi-structured interviews, non-participant classroom observations, and document analysis of lesson plans, assessment records, and remedial program guidelines, enabling triangulation between teachers' stated rationales, observed practices, and institutional expectations.

The primary research instrument was an interview protocol developed from the conceptual framework of instructional strategies for learning recovery, complemented by an observation checklist and a document-review matrix to ensure systematic capture of strategy types and implementation features. Instrument quality was strengthened through expert judgment for content validity, pilot testing to refine question clarity, and inter-coder agreement procedures to enhance analytical reliability during the coding process. Data analysis followed thematic analysis using an iterative cycle of open coding, axial coding, and selective coding, supported by cross-case comparison to identify dominant strategy patterns and contextual determinants. Ethical rigor was ensured through informed consent, voluntary participation, anonymity via pseudonyms, secure data storage, and the explicit minimization of power imbalance by clarifying that the study did not evaluate teacher performance but examined pedagogical decision-making within recovery conditions.

RESULTS AND DISCUSSION
Diagnostic-Driven Instruction and Targeted Remediation in Post-Pandemic Classrooms

Teachers across the observed sites consistently framed learning loss as a problem of instructional visibility, meaning that the primary obstacle was not students' unwillingness to learn but teachers' limited access to reliable information about what students could actually do after prolonged disruption. Interview data indicated that most participants perceived conventional summative testing as insufficient for recovery because it tended to confirm failure without revealing actionable learning pathways, which aligns with arguments that learning loss debates often overemphasize measurement while under-specifying pedagogical response mechanisms (Zhang & Storey, 2022). Observation records showed that teachers increasingly relied on low-stakes diagnostic checks embedded into daily instruction, including short retrieval tasks, quick writing prompts, and error-analysis discussions, rather than using a single baseline test as the sole indicator of readiness. Document analysis further demonstrated that teachers' lesson plans contained explicit "re-entry" segments that functioned as informal placement procedures, with teachers describing these segments as necessary to prevent content coverage from becoming an acceleration of misunderstanding. These findings support the view that post-pandemic

recovery requires redesigned assessment-instruction relations in which teachers treat diagnostics as a continuous pedagogical practice rather than a one-time evaluative event (Chen, 2023).

A recurring theme was the emergence of remediation as a layered strategy, where teachers differentiated not only by level but by type of deficit, distinguishing conceptual gaps from procedural gaps and motivational disengagement. Teachers reported that students who appeared to have "forgotten" content often lacked prerequisite conceptual structures, suggesting that learning loss was experienced as a breakdown of learning progression rather than a simple decline in isolated skills. This pattern resonates with research indicating that learning loss is deeply entangled with structural and contextual factors that mediate students' access to consistent instructional opportunities (Alejo et al., 2023). Classroom observations showed that teachers frequently used short re-teaching cycles followed by immediate application tasks, which were framed as "repairing foundations" rather than repeating previous lessons. Teachers' accounts also revealed a strategic shift toward emphasizing core competencies, particularly literacy and numeracy, even in non-language and non-mathematics subjects, because teachers believed these competencies functioned as cross-curricular recovery levers. This finding converges with evidence that literacy-oriented interventions can serve as a pragmatic entry point for learning loss recovery, even when implemented under constrained instructional time (Anggraeni & Wicaksono, 2023).

Teachers' diagnostic practices were not only instructional but also interpretive, because participants described having to reconstruct students' learning histories from incomplete records and inconsistent prior assessments. In several sites, teachers noted that student transitions between remote and face-to-face instruction had produced discontinuities in documentation, making it difficult to identify whether gaps were recent, cumulative, or related to specific instructional modes. Such observations reflect broader critiques that post-pandemic learning systems often lack coherent data infrastructures capable of supporting individualized remediation at scale (Kenayathulla & Yemini, 2023). Teachers responded by combining student work analysis with conversational assessment, asking students to explain reasoning aloud to reveal misconceptions that written answers concealed. This approach indicates that teachers were not simply diagnosing achievement levels but diagnosing learning processes, which is consistent with contemporary perspectives that treat assessment as a tool for instructional redesign rather than a mechanism of ranking (Chen, 2023). The data suggest that the post-pandemic classroom has intensified the role of teacher judgment, positioning teachers as both pedagogical designers and interpretive analysts of student learning trajectories.

The observed remediation strategies frequently included flexible grouping arrangements that were renegotiated weekly or even daily, indicating that teachers treated grouping as a dynamic response to diagnostic evidence rather than a fixed tracking system. Teachers described using temporary skill-based groups for targeted practice, while maintaining heterogeneous whole-class instruction for concept introduction, a pattern suggesting an attempt to balance equity concerns with practical remediation needs. This balancing act reflects the conceptual tension in the literature between the necessity of targeted support and the risk of reproducing stratification through permanent ability grouping (Robbins & Cipollone, 2023). Teachers justified their approach by emphasizing that groups were fluid and based on observable learning needs rather than perceived student capacity, which they believed protected students from stigma while enabling focused support. Observational data showed that teachers often rotated among groups to provide micro-scaffolding, using prompts and immediate feedback to accelerate correction of misconceptions. These findings imply that remediation was operationalized as instructional adaptation rather than as a separate program detached from everyday teaching, reinforcing arguments that recovery must be embedded in routine pedagogy to be sustainable (Kenayathulla & Yemini, 2023).

A quantitative summary of coded observational segments provides additional clarity regarding the distribution of diagnostic and remediation strategies across sites and subject areas. The coding indicated that formative diagnostic checks and short remediation cycles appeared more frequently than technology-intensive strategies, suggesting that teachers prioritized pedagogical immediacy over tool dependence. This pattern is consistent with evidence that technology integration post-pandemic is mediated by teacher attitudes and institutional support, meaning that teachers may adopt technology selectively when it clearly enhances learning rather than as a symbolic marker of modernization (Adhya & Panda, 2022). The frequency distribution also indicates that targeted remediation was not confined to literacy or numeracy teachers, but appeared across disciplines, supporting the argument that learning

loss recovery has become a cross-curricular responsibility rather than a specialist task (Rahaman et al., 2022). The table below presents the coded frequency of dominant instructional strategies derived from triangulated observation, interview, and document data, providing an empirical anchor for interpreting the qualitative themes. The distribution strengthens the claim that diagnostic-driven instruction functions as the organizing principle of post-pandemic recovery pedagogy, shaping how teachers allocate time, sequence content, and decide when to slow down or accelerate.

Table 1. Frequency of Observed Instructional Strategies for Learning Loss Recovery (Cross-Site Coding Summary)

Instructional Strategy Category	Frequency (Coded Segments)	Relative Emphasis (%)
Embedded formative diagnostic checks	86	24.6
Targeted re-teaching cycles (micro-remediation)	74	21.1
Differentiated tasks and flexible grouping	62	17.7
Structured literacy/numeracy reinforcement across subjects	49	14.0
Technology-supported practice and feedback	41	11.7
Parent-mediated follow-up and home learning coordination	38	10.9

Source: Primary data from classroom observations, teacher interviews, and document analysis (thematic coding output)

Interpretation of Table 1 indicates that teachers' instructional strategies were dominated by practices that could be enacted immediately within classroom routines, which suggests that recovery work is being carried primarily by teacher-led pedagogical adaptation rather than by external programs. The prominence of embedded diagnostic checks implies that teachers have internalized the need to continuously recalibrate instruction, supporting conceptual claims that post-pandemic teaching requires redesigning the relationship between assessment and instruction (Chen, 2023). The relatively lower emphasis on technology-supported practice does not indicate rejection of technology, but reflects a pragmatic prioritization of strategies that are robust under variable access conditions, consistent with findings that technology-enabled learning adoption is shaped by perceived feasibility and pedagogical utility (Adhya & Panda, 2022). The presence of parent-mediated coordination as a non-trivial category suggests that teachers conceptualized recovery as extending beyond classroom boundaries, aligning with evidence that post-pandemic learning recovery increasingly depends on home-school partnership structures (Widodo et al., 2023). The table also underscores that flexible grouping and differentiation occupy a central position, indicating that teachers responded to heterogeneity not as a temporary inconvenience but as a defining feature of post-pandemic classrooms.

Teachers' accounts revealed that diagnostic-driven instruction was often constrained by curriculum pacing expectations, producing a persistent tension between institutional accountability and pedagogical realism. Several participants described pressure to "catch up" to pre-pandemic standards, while simultaneously recognizing that accelerating content coverage without addressing foundational gaps would likely amplify disparities. This tension parallels critiques that post-pandemic recovery risks reproducing pre-pandemic inequities if systems focus on returning to normal rather than reimagining schooling structures that created vulnerability in the first place (Robbins & Cipollone, 2023). Teachers navigated this dilemma by compressing curricular units and foregrounding essential learning outcomes, a strategy that effectively redefined curriculum as a hierarchy of priorities rather than a linear sequence. Observation data confirmed that teachers spent substantial time on prerequisite activation and conceptual anchoring, even when official lesson plans suggested a faster pace. This indicates that teachers' instructional strategies were not simply reactive but involved deliberate curricular decision-making, positioning teachers as policy interpreters within classroom realities (Rahaman et al., 2022).

The findings also highlight how diagnostic and remediation strategies were intertwined with students' socio-emotional reintegration, which teachers treated as a prerequisite for academic recovery rather than a separate pastoral concern. Teachers reported that disengagement, low confidence, and fear of failure were common barriers, particularly among students who experienced prolonged isolation or

inconsistent learning routines. Such accounts align with evidence that post-pandemic learning loss cannot be understood purely as cognitive decline because it is shaped by systemic conditions that produce vulnerability, including digital inequities and disrupted support systems (Chiu, 2025). In practice, teachers used strategies such as normalizing mistakes, providing low-risk opportunities for participation, and using collaborative problem-solving to reduce performance anxiety. Observations showed that these practices often occurred within remediation cycles, indicating that socio-emotional support was embedded into instructional design rather than added as an extracurricular intervention. This integration suggests that teachers' recovery strategies were implicitly aligned with holistic models of learning that recognize the inseparability of academic progress and classroom climate.

Another significant pattern was the influence of teachers' professional identity on how they interpreted learning loss and selected instructional strategies, with participants describing a shift from content deliverers to learning recovery facilitators. Teachers reported that the pandemic and its aftermath forced them to reconsider what counts as effective teaching, often prioritizing responsiveness and relational pedagogy over traditional performance-oriented norms. This resonates with studies showing that post-pandemic teaching practices reshape professional identity by compelling educators to adapt to new expectations and uncertainty, even across diverse educational contexts (Tleuov, 2025). Participants also noted that teacher education and professional development had not fully prepared them for diagnosing heterogeneous learning gaps at scale, echoing evidence that pre-service experiences during remote learning have produced uneven readiness for post-pandemic instructional challenges (Ali & Nath, 2023). Teachers compensated through peer collaboration, informal learning communities, and iterative experimentation, indicating that professional learning occurred within practice rather than through formal training alone. This finding supports the argument that post-pandemic recovery requires not only strategy adoption but also systemic support for teacher learning as a continuous process (Fletcher et al., 2022).

The final theme within this sub-section concerns the extent to which teachers' remediation strategies were shaped by cross-cultural and institutional differences in e-learning exposure and online teaching experiences. Participants from sites with stronger digital infrastructure reported using blended remediation tools more frequently, while teachers from lower-resource contexts relied on paper-based diagnostics and face-to-face scaffolding, suggesting that strategy choice was constrained by structural feasibility rather than teacher preference. This pattern is consistent with cross-cultural evidence that e-learning effectiveness and adoption vary substantially by context, institutional capacity, and cultural expectations of teaching and learning (Nouraey et al., 2023). Teachers also described that students' learning behaviors had been altered by online learning habits, including reduced attention span and increased dependence on external prompts, aligning with findings that online teaching during the pandemic has had measurable effects on learning performance and engagement (Sharma & Saini, 2024). These contextual differences did not eliminate the centrality of diagnostic-driven instruction, but they shaped the tools and pacing through which diagnostics and remediation were enacted. The findings indicate that the post-pandemic recovery agenda cannot be operationalized through a single universal strategy package, because effective remediation is mediated by context-sensitive professional judgment and resource conditions (Kenayathulla & Yemini, 2023).

Technology-Enabled, Blended, and Adaptive Instruction as Post-Pandemic Recovery Practice

Across the multiple sites, teachers positioned technology not as a substitute for face-to-face pedagogy but as an enabling layer that could extend practice opportunities, accelerate feedback, and stabilize instructional continuity under conditions of persistent heterogeneity. Interview data indicated that most teachers did not equate post-pandemic recovery with "more digital learning," but with selective digital integration aimed at compensating for time scarcity and uneven student readiness. This stance reflected a pragmatic form of blended pedagogy in which teachers adopted tools when they could clearly articulate the learning function, rather than when tools merely signaled modernity or innovation. Such patterns align with the argument that post-pandemic redesign requires reframing the relations among learning, assessment, and professional development, rather than assuming that technology adoption alone constitutes educational recovery (Chen, 2023). Observational evidence showed that teachers' technology use was most visible during practice-and-feedback segments, suggesting that digital tools were leveraged primarily for efficiency in formative learning cycles rather than for content delivery.

Teachers' accounts revealed that the strongest predictor of technology use was not subject domain but perceived feasibility, which depended on infrastructure reliability, student device access, and teachers' confidence in managing hybrid learning flows. Participants working in contexts with inconsistent connectivity described limiting technology to teacher-controlled projection and offline resources, while teachers in better-resourced sites integrated learning management systems, short quizzes, and automated feedback tasks. This cross-site variation supports the view that post-pandemic learning disparities are maintained not only by student-level differences but by systemic conditions that shape the instructional opportunities available to teachers (Alejo et al., 2023). Several teachers described technology as a "diagnostic amplifier," because digital quizzes and interactive tasks produced immediate evidence of misconceptions, enabling rapid adjustment in subsequent instruction. Such use echoes findings that teacher attitudes toward technology-enabled learning influence the likelihood that digital tools become embedded into pedagogically meaningful routines, rather than remaining superficial add-ons (Adhya & Panda, 2022). The data suggest that blended instruction was enacted as a form of adaptive expertise, requiring teachers to continuously decide what must be done in person and what can be delegated to structured digital practice.

Classroom observations indicated that teachers rarely used technology for prolonged synchronous teaching, reflecting an implicit critique of the emergency remote learning model that many participants associated with disengagement and shallow participation. Teachers who had experienced remote teaching described that the post-pandemic period made them more attentive to the cognitive and motivational costs of passive screen-based instruction, particularly for students with weak self-regulation. This perception is consistent with evidence that online teaching during the pandemic produced measurable impacts on learning performance and engagement, with effects varying by instructional quality and students' learning conditions (Sharma & Saini, 2024). Teachers reported shifting toward shorter digital tasks paired with immediate in-class discussion, which effectively repositioned technology as a tool for eliciting student thinking rather than replacing teacher explanation. Document analysis supported this interpretation by showing that lesson plans often listed digital components as "practice," "retrieval," or "check," while core concept-building remained anchored in face-to-face dialogue. These patterns suggest that technology integration in learning loss recovery is best conceptualized as a strategic reallocation of instructional functions, not as a binary choice between online and offline learning.

Teachers' technology-mediated strategies were strongly shaped by their professional identities, with several participants describing that the pandemic compelled them to reconstruct what it means to be an effective teacher in an environment where digital competence is necessary but insufficient. Participants frequently described feeling that their professional legitimacy had been challenged during remote learning, which motivated them to reclaim authority through more intentional instructional design and clearer feedback structures. This dynamic resonates with evidence that post-pandemic teaching practices are intertwined with identity adaptation, as educators renegotiate their roles under shifting institutional expectations and student needs (Tleuov, 2025). Teachers also described that formal teacher education had not prepared them adequately for blended pedagogies, especially for diagnosing learning gaps through digital traces and integrating those traces into classroom decision-making. Such concerns align with research on pre-service teachers' remote learning experiences, which suggests that teacher preparation programs must be reimagined to develop pedagogical and technological integration competencies rather than treating them as separate skill sets (Ali & Nath, 2023). The findings indicate that technology-enabled recovery strategies are not merely technical decisions but professional and epistemic decisions about what counts as evidence, instruction, and learning.

A key empirical theme was the emergence of "adaptive scaffolding" in blended environments, where teachers used technology to create differentiated pathways while maintaining shared conceptual goals. Teachers described assigning tiered tasks through digital platforms, with students progressing through levels based on performance, which allowed teachers to manage heterogeneity without visibly labeling students as low-achieving. This strategy corresponds with broader claims that learning loss recovery requires systematic, equitable differentiation mechanisms rather than informal improvisation that may unintentionally reproduce inequities (Kenayathulla & Yemini, 2023). Observational data showed that teachers frequently used automated quizzes for quick placement into practice sets, then used in-person time for targeted explanation, indicating that technology served as a triage mechanism. The following table summarizes coded patterns of technology-enabled instructional functions observed

across sites, clarifying how digital tools were integrated into learning loss recovery rather than describing technology use in generic terms. The distribution provides empirical grounding for interpreting teachers' blended strategies as structured pedagogical choices linked to diagnostic, practice, and feedback cycles.

Table 2. Observed Functions of Technology Use in Learning Loss Recovery Instruction (Cross-Site Coding)

Technology-Enabled Instructional Function	Frequency (Coded Segments)	Typical Classroom Manifestation
Rapid formative checks and instant scoring	44	Short quizzes, polls, exit tickets
Differentiated practice pathways	37	Tiered tasks, adaptive question sets
Feedback acceleration and error visibility	31	Auto-feedback items, analytics dashboards
Resource consolidation for revision	28	Shared folders, recorded micro-lessons
Communication and coordination with parents	19	Messaging, progress updates, reminders

Source: Primary data from classroom observations, teacher interviews, and document analysis (thematic coding output)

Interpretation of Table 2 indicates that teachers' technology use was oriented toward strengthening the feedback infrastructure of learning recovery, rather than transforming the curriculum into a fully digital format. The predominance of rapid formative checks suggests that teachers treated digital tools as a mechanism for increasing instructional responsiveness, which aligns with calls to redesign assessment and learning as integrated processes in post-pandemic education (Chen, 2023). Differentiated practice pathways emerged as a central function, indicating that technology supported equity by enabling personalization without publicly stigmatizing students, though the effectiveness of such personalization remained contingent on students' access and self-regulation. The relatively lower frequency of parent communication functions does not imply that teachers disregarded families, but it suggests that digital coordination with parents was often constrained by platform fragmentation and varying parental digital literacy. This constraint resonates with cross-cultural evidence that e-learning ecosystems are uneven and shaped by sociocultural factors that influence how technologies are adopted and sustained (Nouraey et al., 2023). The findings reinforce the claim that technology-enabled recovery is not a universal remedy but a context-dependent instructional infrastructure that can either narrow or widen gaps depending on systemic support conditions (Alejo et al., 2023).

Teachers consistently emphasized that technology-enabled instruction became most productive when it was embedded within a broader pedagogical logic that included explicit modeling, guided practice, and dialogic feedback. Observations showed that when teachers assigned digital tasks without framing, students often completed them mechanically, producing performance traces that appeared successful but did not translate into conceptual understanding during discussion. This pattern supports critiques that post-pandemic learning loss discourse can misinterpret short-term performance gains as meaningful learning, particularly when measurement practices prioritize completion and scores over deep comprehension (Zhang & Storey, 2022). Teachers responded by incorporating "explain-your-answer" routines after digital quizzes, requiring students to articulate reasoning and confront misconceptions collectively. This hybrid strategy suggests that technology was most valuable as a trigger for discourse, not as a replacement for teacher mediation. The findings align with the view that the real challenge of learning loss recovery lies in reimagining schooling as a system of meaningful learning opportunities, rather than treating digitalization as the primary solution (Robbins & Cipollone, 2023).

Another important theme concerned teachers' ethical awareness of digital inequality, which shaped their decisions to limit or redesign technology-based strategies to avoid reproducing structural disadvantages. Several teachers explicitly described the pandemic as revealing a form of hidden

violence in education, where students' learning opportunities were constrained by digital access, home environments, and institutional support, resulting in a persistent recovery gap that teachers continued to confront in post-pandemic classrooms. This perspective parallels conceptualizations of pandemic digital structural violence, which frame learning loss as a manifestation of systemic inequities rather than an individual failure to learn (Chiu, 2025). Teachers responded by creating dual-mode resources, such as printable versions of digital tasks and offline practice packs, ensuring that students without stable devices could still participate in remediation cycles. Document analysis confirmed that some schools institutionalized these dual-mode strategies through official remedial guidelines, indicating that teachers' practices sometimes influenced organizational policy rather than remaining isolated classroom improvisations. Such findings suggest that teacher strategy selection can function as an equity intervention when teachers recognize technology as a risk factor for disparity, not merely as a pedagogical opportunity. The data underscore that blended recovery instruction requires ethical design choices that explicitly account for access and participation constraints.

Teachers also described that technology-enabled strategies influenced the relational dynamics of the classroom, particularly by changing how students experienced feedback, autonomy, and accountability. Some participants reported that students became more willing to attempt tasks when feedback was delivered privately through digital systems, reducing fear of public embarrassment, which teachers interpreted as supporting engagement during recovery. This observation is consistent with literature emphasizing that teachers must be treated as agents for change in the post-pandemic era, capable of elevating student participation by designing psychologically safer learning environments (Fránquiz et al., 2023). At the same time, teachers noted that digital systems could encourage superficial engagement, with students guessing answers or relying on peers, requiring teachers to strengthen monitoring and integrate accountability routines. Such tensions illustrate that technology is pedagogically ambivalent, amplifying both productive and unproductive learning behaviors depending on instructional framing. Teachers' strategies reflected an attempt to balance autonomy with guidance, often using digital tools to offer choice while anchoring learning in shared classroom discourse. The findings indicate that technology-enabled recovery practices are most effective when teachers treat digital tools as components of a broader instructional ecology rather than as standalone interventions.

A final theme in this sub-section concerns how teachers interpreted post-pandemic recovery as an opportunity to expand the scope of instruction beyond academic remediation, integrating values, care, and relational pedagogy into their strategic repertoire. Several teachers described adopting classroom routines that emphasized empathy, mutual support, and student well-being as a foundation for sustained learning engagement, arguing that cognitive recovery would remain fragile without relational repair. This framing resonates with literature on the "Love Curriculum" approach, which proposes that addressing learning loss requires integrating affective and moral dimensions into instructional practice across primary and secondary schooling (Sari, 2025). Teachers did not frame such routines as replacing academic rigor, but as strengthening the conditions under which rigorous learning could occur, particularly for students who returned with diminished confidence and heightened anxiety. These findings extend the argument that teachers' post-pandemic strategies must be understood as multidimensional, combining cognitive scaffolding with socio-emotional support and ethical responsiveness. The evidence suggests that blended and adaptive instruction becomes a recovery practice not simply because it uses technology, but because it reorganizes teaching around responsiveness, equity, and the reconstruction of learning relationships in post-pandemic schooling.

Professional Capacity Building, Socio-Emotional Re-Engagement, and Collaborative Partnerships for Sustainable Learning Recovery

Teachers' instructional strategies in post-pandemic classrooms extended beyond academic remediation into a layered set of professional, socio-emotional, and collaborative practices that supported sustainable learning recovery across sites. Interview narratives consistently indicated that learning loss was perceived not only as a deficit in content mastery but also as a disruption of learner motivation, classroom routines, and students' capacity to persist through cognitively demanding tasks. This finding aligns with arguments that the post-pandemic period must be approached as an opportunity to redesign schooling practices rather than merely accelerate curriculum pacing (Robbins & Cipollone, 2023; Chen, 2023). Observational evidence further showed that teachers who reported the strongest instructional coherence were those who explicitly linked remediation goals to student well-being and

classroom climate, indicating a practical convergence between academic recovery and socio-emotional stabilization. Such integration also resonates with teachers' reported experiences of structural inequities and persistent barriers in post-pandemic learning environments, which shape instructional choices in ways that are not fully captured by test-based learning loss metrics alone (Chiu, 2025; Alejo et al., 2023).

A dominant pattern across the multiple sites was the use of professional learning routines that functioned as "instructional repair mechanisms," enabling teachers to recalibrate strategies through iterative reflection and shared problem-solving. Teachers described engaging in informal communities of practice, lesson study, peer observation, and collaborative planning sessions as core mechanisms for translating post-pandemic challenges into actionable instructional responses. This pattern supports the view that teacher professional development in the post-pandemic era must be reframed as an ongoing adaptive process closely linked to classroom realities rather than episodic training disconnected from implementation constraints (Chen, 2023; Fletcher et al., 2022). Teachers also emphasized that their professional identity shifted toward being "learning recovery facilitators," a role requiring both pedagogical agility and emotional labor in managing students' uneven readiness. Such identity renegotiation is consistent with post-pandemic studies showing that instructional adaptation is deeply entangled with how teachers reconstruct their professional purpose after prolonged disruption (Tleuov, 2025; Fránquiz et al., 2023). Importantly, participants reported that professional collaboration increased the perceived feasibility of remediation because shared planning reduced uncertainty and distributed the cognitive workload of designing targeted interventions.

Classroom observation data indicated that socio-emotional re-engagement was enacted through explicit instructional routines, rather than treated as a peripheral add-on, with teachers integrating motivational scaffolds into core academic activities. Teachers frequently used short restorative openings, structured peer interaction, and predictable lesson sequences to rebuild learners' sense of safety and task commitment. These practices were often justified as necessary responses to post-pandemic disengagement and reduced attention spans, which teachers described as persistent even after the return to full in-person schooling. The pattern reflects broader post-pandemic analyses that identify learning loss as intertwined with disrupted learning behaviors and diminished engagement, particularly among students who experienced unequal access to remote instruction (Sharma & Saini, 2024; Kenayathulla & Yemini, 2023). Teachers also noted that socio-emotional stabilization reduced classroom management time and increased opportunities for deeper instruction, suggesting an indirect pathway through which well-being-oriented strategies can strengthen academic outcomes. This finding is compatible with the argument that the most productive post-pandemic reforms are those that integrate academic, relational, and institutional dimensions rather than privileging one domain in isolation (Rahaman et al., 2022; Robbins & Cipollone, 2023).

The qualitative evidence further showed that teachers' socio-emotional strategies were not uniform across sites, but were shaped by perceived community vulnerability, student home learning histories, and institutional expectations regarding recovery targets. Teachers working in settings with higher reported learning disparities described greater reliance on relationship-centered instruction and gradual re-entry routines, while those in comparatively stable settings emphasized academic acceleration paired with selective emotional supports. This cross-site differentiation is consistent with literature indicating that post-pandemic learning disparities are not only measurable outcomes but also socially produced conditions that influence instructional decision-making and resource allocation (Alejo et al., 2023; Chiu, 2025). Teachers explicitly framed their instructional planning as a balancing act between institutional accountability pressures and the pedagogical necessity of rebuilding learner confidence. Such tensions align with prior critiques that learning loss discourse can obscure structural factors by focusing excessively on standardized measurements, thereby pushing teachers toward narrow remediation models (Zhang & Storey, 2022; Robbins & Cipollone, 2023). Observational fieldnotes supported this claim by documenting instances in which teachers slowed pacing despite curricular demands, indicating that instructional judgment was frequently guided by immediate classroom readiness rather than formal recovery timelines. This reinforces the need for post-pandemic policy frameworks that recognize instructional responsiveness as a legitimate form of effectiveness, particularly in contexts of uneven recovery.

Teachers also reported that the integration of technology remained relevant in this sub-section, not primarily as a delivery mechanism but as a support system for professional learning, student

motivation, and formative monitoring. Several participants described using digital platforms to share lesson resources, compare assessment patterns, and coordinate remediation schedules across grade-level teams, suggesting that technology-enabled collaboration became a structural element of post-pandemic instructional work. This finding extends previous evidence that teachers' attitudes toward technology-enabled learning influence not only classroom delivery but also the sustainability of pedagogical innovation after crisis-driven adoption (Adhya & Panda, 2022; Ali & Nath, 2023). In addition, teachers described selective use of digital tools to provide motivational feedback, micro-credentials, and short reinforcement tasks that reduced students' anxiety about academic failure. Such practices correspond to cross-cultural reviews highlighting that e-learning tools, when embedded into broader pedagogical systems, can enhance continuity and personalization rather than merely replicating traditional instruction online (Nouraey et al., 2023; Sharma & Saini, 2024). Observational data indicated that technology use in this phase was less intensive than during emergency remote learning, but more strategically aligned with instructional and emotional goals. This pattern supports the view that post-pandemic recovery is characterized by a shift from technology as necessity to technology as a calibrated instrument within blended pedagogical ecosystems (Chen, 2023; Adhya & Panda, 2022).

A consistent empirical theme across interview and document analysis was that teachers perceived parental involvement and community partnership as indispensable for addressing learning loss, particularly for students with persistent disengagement and low homework completion. Teachers described using structured communication routines, parent briefings, and progress summaries to align home support with school-based remediation plans. This aligns with evidence suggesting that partnership-based models can reduce post-pandemic learning loss by strengthening continuity of learning routines and shared responsibility between schools and families (Widodo et al., 2023; Widayanti et al., 2023). Participants emphasized that parental involvement was most effective when framed as collaborative rather than corrective, indicating sensitivity to the stigma that families sometimes experience when schools communicate about learning deficits. This approach resonates with critiques that deficit framing can intensify inequities by blaming households for systemic disruption, rather than building shared recovery pathways (Alejo et al., 2023; Zhang & Storey, 2022). Document analysis of remedial program guidelines further showed that schools increasingly formalized parent communication protocols, indicating institutional recognition that learning recovery requires multi-actor coordination. The empirical evidence therefore positions collaborative partnership as an instructional strategy in itself, functioning as an enabling condition for sustained remediation.

The patterns of teacher practice identified across sites can be summarized through the frequency of strategy mentions in interviews and corroborated through observation and document traces, as displayed in Table 3. The table is not intended as a quantitative generalization but as a structured representation of dominant themes that emerged repeatedly across data sources within the qualitative design. Teachers' strongest emphasis was placed on socio-emotional re-engagement and professional collaboration, followed by parent partnership and the strategic use of technology for coordination and feedback. These distributions reflect the post-pandemic shift toward viewing learning recovery as a complex system challenge rather than a purely instructional pacing problem (Kenayathulla & Yemini, 2023; Chen, 2023). The thematic density also aligns with evidence that the most severe learning disparities require interventions that combine classroom strategy with relational and structural supports (Alejo et al., 2023; Chiu, 2025).

Table 3. Dominant Instructional and Support Strategies for Post-Pandemic Learning Recovery (Qualitative Theme Frequency Across Sites)

Strategy Theme	Primary Evidence Source(s)	Frequency of Mentions (Interviews)	Observed Implementation (Yes/No)	Document Trace (Yes/No)
Socio-emotional re-engagement routines	Interviews, Observations	28	Yes	Yes
Professional collaboration and peer learning	Interviews, Documents	24	Indirect	Yes

Parent and community partnership	Interviews, Documents	19	Limited	Yes
Technology-supported coordination and feedback	Interviews, Observations	17	Yes	Yes
Motivational scaffolding in core instruction	Interviews, Observations	15	Yes	No

Source: Field data from semi-structured interviews, non-participant classroom observations, and document analysis (multiple-site qualitative study)

Interpretation of Table 3 suggests that teachers' learning recovery strategies operated as an integrated ecosystem in which instructional techniques, professional capacity, and relational support reinforced one another. The prominence of socio-emotional re-engagement indicates that teachers perceived student affect and motivation as prerequisites for effective remediation, consistent with post-pandemic studies describing learning loss as partly driven by disrupted learning behaviors and reduced engagement (Sharma & Saini, 2024; Widayanti et al., 2023). The strong emphasis on professional collaboration suggests that teachers relied on collective expertise to manage uncertainty and design feasible interventions, supporting findings that post-pandemic teacher preparation and professional learning require adaptive, practice-based models (Fletcher et al., 2022; Ali & Nath, 2023). Parent partnership appeared less frequently than socio-emotional routines, yet its consistent documentation trace implies institutional formalization, aligning with partnership frameworks in post-pandemic recovery research (Widodo et al., 2023; Kenayathulla & Yemini, 2023). Technology-supported coordination was framed as an enabling tool rather than a replacement for instruction, reinforcing post-pandemic evidence that blended and digital practices persist when aligned with pedagogical goals and teacher confidence (Adhya & Panda, 2022; Nouraey et al., 2023). The combined pattern indicates that sustainable learning recovery depends on strategies that are pedagogically grounded, socially responsive, and organizationally supported.

An additional finding was that teachers viewed structured remediation periods, including after-school tutoring and short-term catch-up programs, as necessary but insufficient without continuity into regular instruction. Teachers described how short-term interventions created initial gains but often faded when not integrated into classroom routines and formative monitoring systems. This observation aligns with research on learning loss remediation indicating that sustained recovery requires continuity of practice and targeted support, rather than isolated programs that cannot be maintained over time (Gierczyk & Hornby, 2023; Anggraeni & Wicaksono, 2023). Teachers also reported that summer and holiday periods, when not structured with supportive learning opportunities, contributed to renewed learning regression among already vulnerable learners. Such claims are consistent with broader evidence on seasonal learning loss and its implications for post-pandemic remediation, particularly for students who experienced compounded disruption (Gierczyk & Hornby, 2023; Alejo et al., 2023). Document analysis showed that schools increasingly attempted to formalize remedial scheduling, yet teachers noted constraints in staffing, student attendance, and parental support. The evidence indicates that remediation programs are most effective when embedded in a wider recovery ecology that includes motivation, relationships, and institutional coordination.

Teachers also highlighted that learning recovery strategies were mediated by institutional policy and the framing of learning loss within school accountability systems. Several participants described pressure to demonstrate measurable improvement, which sometimes narrowed instructional focus toward test-aligned outcomes at the expense of deeper conceptual rebuilding. This finding reflects critiques that learning loss discourse can produce controversies by prioritizing measurement while under-recognizing historical inequities and contextual determinants of student performance (Zhang & Storey, 2022; Chiu, 2025). At the same time, teachers acknowledged that some form of monitoring was necessary to identify progress and justify resource allocation, indicating a pragmatic acceptance of accountability mechanisms when used constructively. This balanced stance aligns with post-pandemic policy discussions emphasizing the need to recover losses while redesigning assessment and

professional development systems to avoid reductive interpretations of student capability (Chen, 2023; Kenayathulla & Yemini, 2023). Teachers' narratives therefore positioned instructional strategy as constrained agency, shaped by systemic expectations yet enacted through professional judgment. This interpretation also supports scholarship arguing that the post-pandemic period should elevate teacher expertise as an agent of change rather than treating teachers as implementers of externally imposed recovery scripts (Fránquiz et al., 2023; Rahaman et al., 2022). The evidence suggests that sustainable learning recovery depends on policy environments that support responsive pedagogy rather than exclusively rewarding short-term measurable gains.

Across sites, teachers' strategic responses to learning loss also intersected with values-based pedagogical orientations, including culturally and ethically grounded approaches to restoring learner dignity and belonging. Some participants described integrating moral and relational instruction to rebuild student empathy, peer respect, and classroom solidarity, framing these as foundations for academic persistence. This finding is consistent with literature emphasizing the role of value-oriented curriculum approaches in learning recovery, particularly in contexts where education is expected to cultivate holistic development alongside academic competence (Sari, 2025; Rahaman et al., 2022). Teachers described that when students experienced renewed belonging, participation increased and avoidance behaviors declined, supporting the theoretical link between relational climate and cognitive engagement. Such results also align with the argument that post-pandemic recovery should not replicate pre-pandemic schooling structures uncritically, but should rebuild educational practices around human-centered and socially responsive priorities (Robbins & Cipollone, 2023; Chen, 2023). Importantly, this orientation did not replace academic remediation but functioned as an enabling condition that strengthened the effectiveness of targeted instruction described in earlier sections. The empirical evidence therefore indicates that learning recovery is most sustainable when teachers' instructional strategies combine diagnostic precision, adaptive delivery, professional learning, and relational partnership within a coherent post-pandemic pedagogical framework.

CONCLUSION

This study demonstrates that teachers' instructional strategies for addressing post-pandemic learning loss are most effective when enacted as an integrated recovery system that combines diagnostic precision, adaptive instructional delivery, and sustained relational support. Evidence across sites indicates that diagnostic-driven instruction enables teachers to identify heterogeneous gaps and design targeted remediation that is responsive to students' readiness profiles, thereby strengthening instructional efficiency and equity. Technology-enabled, blended, and adaptive practices further extend recovery capacity by supporting differentiated pacing, continuous feedback, and flexible access to learning opportunities, particularly for students experiencing persistent disruption. Beyond instructional techniques, sustainable learning recovery is reinforced through professional collaboration, socio-emotional re-engagement routines, and structured partnerships with families, which collectively stabilize learner motivation and improve the feasibility of long-term remediation. The findings also highlight that learning loss is not merely an academic phenomenon but a multidimensional outcome shaped by structural disparities, institutional accountability pressures, and the post-pandemic reconstruction of teacher professional identity. Overall, the study underscores the need for recovery-oriented pedagogical frameworks and policy environments that legitimize responsive teaching, strengthen teacher capacity, and align assessment with holistic learning restoration.

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