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Fostering Knowledge Diffusion Through Public-Private School Collaboration: An Educational Transformation Model In Malang City

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Abstract

Collaboration between public and private secondary schools creates opportunities for pedagogical knowledge exchange, yet existing interactions may remain fragmented when they lack sustained coordination and shared knowledge-management mechanisms. Developing an operational framework to address these barriers is therefore important for strengthening cross-school collaboration. This study aims to develop and preliminarily assess an Educational Transformation Ecosystem Model to facilitate knowledge diffusion among senior high schools in Malang City. A mixed-methods design was employed within a Design-Based Research (DBR) framework, comprising needs analysis, conceptual model development, two-round Delphi review, and a three-month pilot study. The needs analysis involved eight respondents, comprising four school principals and four teacher representatives. Four doctoral-level experts, two in management and two in education, reviewed the model, while 16 participants evaluated its implementation using a ten-item questionnaire with a four-point Likert scale. Findings identified limited time, fragmented coordination, dependence on informal networks, and inadequate shared knowledge documentation as key barriers. The resulting model integrates collaborative governance, cross-school Professional Learning Communities, a shared digital repository, and four implementation phases. Expert ratings averaged 86.4%, while the pilot yielded an aggregate implementation-feasibility score of 81.9%. These preliminary findings provide a context-specific

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framework for organizing cross-school knowledge exchange, warranting further evaluation of its sustainability and effectiveness.

Keywords: Knowledge Diffusion; School Collaboration; Collaborative Governance

INTRODUCTION

Secondary schools increasingly operate in educational environments in which the development and improvement of teaching practices require access to knowledge, expertise, and professional experience beyond individual institutional boundaries (Demartini et al., 2024; Falloon, 2020; Farrell et al., 2022). Rather than treating schools as self-contained instructional organizations, an ecosystem perspective emphasizes their potential to function as interconnected sites of professional learning, knowledge exchange, and pedagogical improvement (Oke & Fernandes, 2020). This perspective is particularly relevant when schools face complex educational challenges that may exceed the expertise or resources available within a single institution (Kasneci et al., 2023; Nadeem, 2024). Alenezi (2023) the capacity to improve educational practice consequently depends not only on the development of knowledge within schools but also on the opportunities available to share, critically examine, adapt, and apply that knowledge across institutional boundaries.

In this context, collaboration between public and private secondary schools represents a potential avenue for connecting diverse institutional experiences and expanding opportunities for professional learning (Bryant & Walker, 2024; Schnellert & Butler, 2021). However, cross-sectoral collaboration should not be assumed to emerge automatically from the coexistence of different school types (Arar et al., 2026). Differences in organizational priorities, leadership arrangements, resources, and institutional cultures may create opportunities for reciprocal learning while also complicating coordination and the adoption of shared practices (Friedman, 2023). Research on educational partnerships indicates that the benefits of collaboration depend on the relationships and arrangements through which participating institutions work together, rather than on partnership structures alone. Accordingly, public private school collaboration requires mechanisms that support mutual participation, clarify responsibilities, and enable pedagogical knowledge to circulate without disregarding the distinct characteristics of individual schools.

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Research on teacher collaboration provides an important foundation for understanding these challenges. A systematic review of collaboration in secondary schools identifies sharing, experimenting, and designing as distinct collaborative learning activities and shows that their development depends on interacting individual, group, organizational, and structural conditions (Friedman, 2023; Muckenthaler, 2020). This distinction suggests that the existence of communication or professional interaction does not necessarily indicate that teachers are engaging in sustained collaborative learning. Similarly, research on inter-school networks identifies opportunities for social capital development and professional exchange, while emphasizing the importance of network organization and educational leadership in realizing these opportunities (Demetroulis, 2023; Lu, 2018). These studies establish the relevance of collaboration beyond individual schools, but they also indicate the need to examine how professional interaction is organized, sustained, and translated into knowledge use across institutional boundaries.

Despite these contributions, the relationship between inter-school governance arrangements, professional knowledge networks, and the subsequent adaptation of pedagogical innovations warrants more explicit conceptual and empirical examination (Kong, 2018; Lu, 2018). Professional Learning Networks (PLNs), for example, extend collaborative learning beyond individual schools, but their operation involves challenges associated with organizational boundaries, facilitation, shared goals, and the transfer of knowledge back into participating schools (Hulme, 2023; Wang, 2020; Stone, 2018). The existence of a network therefore does not guarantee that knowledge exchanged within it will be incorporated into everyday educational practice (Wang, 2020). A more specific problem concerns the connection between the institutional arrangements that enable collaboration, the professional relationships through which knowledge is exchanged, and the processes through which receiving schools evaluate and adapt that knowledge (Childs, 2018). Addressing this connection requires more than establishing a forum for interaction; it requires a coordinated design linking governance, networked professional learning, knowledge documentation, and the practical use of innovations.

The present study addresses this problem in the context of four senior high schools in Malang City: SMA Negeri 1 Malang and SMA Negeri 5 Malang, representing public schools, and SMA Surya Buana Malang and SMA Nasional Malang, representing private schools. These institutions provide a context for examining how schools with different organizational characteristics can participate in a more structured arrangement for sharing pedagogical

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knowledge. The study focuses on developing an operational model for cross-school collaboration rather than comparing the academic performance of public and private schools or establishing the prevalence of institutional isolation across the entire regional education system. The four-school setting consequently defines the empirical boundary of the research and provides the context in which the model's design and preliminary implementation feasibility are examined.

Against this background, the study aims to develop and preliminarily assess an Educational Transformation Ecosystem Model that facilitates knowledge diffusion through public–private school collaboration. Three research questions guide the investigation: (1) What structural, organizational, relational, and operational conditions shape cross-school knowledge sharing among the four participating senior high schools? (2) How can the identified needs be translated into a collaborative model that connects governance arrangements, professional knowledge exchange, and the adaptation of pedagogical innovations? (3) How do expert assessments and findings from a limited pilot inform the refinement and preliminary evaluation of the proposed model? These questions connect the empirical diagnosis of collaboration barriers to the design, expert review, and initial implementation assessment of the model within a Design-Based Research (DBR) framework.

The conceptual contribution of this study rests on specifying how three complementary perspectives can be connected within an operational design. Collaborative governance provides a basis for examining how participating actors coordinate responsibilities, establish shared commitments, and facilitate collective action. Knowledge ecosystems direct attention to the relationships, infrastructure, and organizational conditions through which knowledge is generated, exchanged, and accessed. Diffusion of innovation provides a perspective on how practices are communicated, evaluated, adapted, and potentially adopted within a social system (Jakhelln, 2022; Yuan, 2018). Considered separately, these perspectives illuminate different parts of the problem: governance explains the organization of collective action, the ecosystem perspective highlights the conditions for knowledge circulation, and diffusion theory addresses the movement and adoption of practices. The proposed model connects these dimensions by linking governance support and trust-building to recurring professional interaction, shared knowledge documentation, contextual adaptation, and subsequent evaluation. This integration is presented as a design proposition to be examined through the research process, rather than as an assumption that combining the theories automatically establishes theoretical novelty.

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The intended contribution is therefore an empirically informed design framework that translates these complementary perspectives into a sequence of collaborative mechanisms for the participating schools. The model combines a facilitating role for the regional education authority, leadership-supported participation, cross-school forums and Professional Learning Communities (PLCs), a shared digital repository, and staged implementation beginning with trust-building. Its contribution is not the claim that public–private collaboration will automatically eliminate institutional fragmentation, but the formulation of a context-specific arrangement through which collaboration and knowledge diffusion can be organized and evaluated. The expert review and three-month pilot provide an initial basis for assessing the model's design and implementation feasibility in the four-school context. Broader claims about long-term sustainability, reductions in educational quality disparities, or transferability to other regions require additional longitudinal and multi-site evaluation. The study thus seeks to contribute both a practical design for organizing cross-school knowledge exchange and a basis for further investigation of the mechanisms connecting collaborative governance with pedagogical knowledge diffusion.

METHODS

Research Design This study adopted a mixed-methods design within a Design-Based Research (DBR) framework (Claravall et al., 2026). This approach was selected because the development of an educational transformation ecosystem model requires both qualitative exploration of institutional relationships, organizational cultures, and governance arrangements and quantitative assessment of expert ratings and preliminary implementation feasibility. The DBR process integrated theoretical perspectives on collaborative governance, knowledge ecosystems, and diffusion of innovation with empirical evidence gathered from participating schools. The development process comprised five interconnected phases: needs analysis, conceptual model design, expert review through a two-round Delphi process, limited pilot testing, and evaluation and refinement. The iterative design enabled the proposed model to be refined in response to documented needs, expert feedback, and pilot-test findings. The study was designed to develop and preliminarily assess a context-specific model rather than establish causal effects or broad generalizability across other regional educational systems.

Research Setting, Participants, and Data Collection The study was conducted at four senior high schools in Malang City: SMA Negeri 1 Malang and SMA Negeri 5 Malang, representing public

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schools, and SMA Surya Buana Malang and SMA Nasional Malang, representing private schools. Purposive sampling was used to select participants with roles relevant to school leadership, curriculum coordination, pedagogical innovation, or educational supervision. The needs-analysis phase involved eight actual respondents: one school principal and one teacher representative from each participating school. The expert-review phase involved four doctoral-level experts, comprising two specialists in management and two specialists in education. The model was reviewed through two Delphi rounds, allowing expert assessments and comments to inform revisions to the proposed design. The pilot test was conducted over three months and involved 16 participants associated with the four participating schools and the regional education authority. The participants comprised four school principals, four vice-principals or curriculum representatives, seven teacher leaders, and one education supervisor or policy representative from the Cabang Dinas Pendidikan. Data collection across the study included in-depth interviews, Focus Group Discussions (FGDs), document analysis, participatory observation, and structured questionnaires. Qualitative data were used to identify collaboration barriers, enabling conditions, and model-development requirements, whereas structured ratings were used to summarize expert assessments and participants' perceptions of implementation feasibility. The use of multiple sources and methods supported the triangulation of findings and informed the iterative development process (Claravall et al., 2026).

Data Analysis, Scoring Procedures, and Model Refinement Qualitative data were analyzed using interactive thematic analysis, involving data reduction, coding, thematic categorization, and interpretation of patterns across the participating schools. The analysis focused on structural and governance barriers, organizational culture, leadership support, professional networks, knowledge-sharing practices, and technological infrastructure. Source and methodological triangulation were used to compare findings across the available interviews, FGDs, observations, documents, and questionnaire records, thereby supporting the credibility of the interpretations (Karyani et al., 2024). Expert-assessment results were summarized as the mean of the four experts' percentage ratings, yielding the reported aggregate score of 86.4%. This figure is reported as a descriptive expert-rating result; it is not treated as a standalone statistical measure of Delphi consensus because a separate formal consensus coefficient or numerical convergence criterion has not been documented in the materials available for this revision. The pilot-test questionnaire comprised 10 items organized into four dimensions: collaborative governance (two items), knowledge ecosystem and innovation exchange (three items), trust-building and

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implementation phasing (two items), and diffusion-related perceptions (three items). Participants rated the model using a four-point Likert scale, ranging from 1 (very unsuitable or ineffective) to 4 (very suitable or effective). The maximum possible aggregate score was calculated as 16 participants × 10 items × 4 points, yielding 640 points. The sum of the 16 participant-level scores was 524, producing an implementation-feasibility score of 81.875%, rounded to 81.9% to one decimal place (524/640 × 100). This score is interpreted as a descriptive participant-rated measure of implementation feasibility, not as proof of causal effectiveness or a demonstrated reduction in institutional isolation. The study used a 70% operational benchmark for the pilot assessment; this threshold should be interpreted as study-specific rather than as a universal methodological standard. The final DBR phase examined the relationship between identified implementation constraints and subsequent design refinements. The documented refinement included a hybrid approach to collaboration, combining monthly synchronous forums with asynchronous knowledge sharing through the proposed digital repository to address scheduling constraints. The final model retained the four implementation phases of trust-building, communication-network development, collaborative-program implementation, and sustainability evaluation. The five DBR phases, corresponding data-collection procedures, and revised success criteria are presented in Table 1.

Table 1. Design-Based Research Phases, Instruments, and Success Criteria

DBR Phase	Objective / Activity Focus	Instruments and Data Collection	Revised Success Criteria
Needs Analysis and Preliminary Study	Identify existing collaboration practices, structural and cultural barriers, enabling conditions, and cross-school knowledge-sharing needs across the four participating schools.	In-depth interviews, FGDs, participatory observation, document analysis, and structured questionnaires, as applicable to the respective data-collection activities.	A documented needs profile identifies collaboration barriers, existing knowledge-sharing channels, institutional priorities, and requirements for a more structured collaboration mechanism. Findings are traceable to the available empirical sources.

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Conceptual Model Design	Integrate collaborative governance, knowledge ecosystems, and diffusion of innovation into an initial model informed by the needs analysis.	Literature review, research-team FGD, and synthesis of empirical findings and theoretical constructs.	An initial model is formulated, with its principal components and proposed mechanisms explicitly linked to the identified needs and relevant theoretical concepts.
Expert Review and Model Calibration	Examine the conceptual coherence, contextual relevance, and proposed operational feasibility of the model through two Delphi rounds.	Structured expert assessments and written feedback from four doctoral-level experts: two in management and two in education.	Expert assessments are summarized transparently, and design changes arising from each round are documented. The reported 86.4% is identified as the mean percentage of expert ratings. Any formal consensus claim requires an explicitly defined and documented consensus criterion.
Limited Pilot Test	Assess participants' perceptions of implementation feasibility and identify operational constraints during a three-month limited implementation.	Ten-item questionnaire using a four-point Likert scale, participant feedback, and implementation observation; 16 participants associated with the four schools and the regional education authority.	The participant-level scores and aggregation procedure are reported transparently. The recalculated score is 524/640, or 81.9%, interpreted as a descriptive implementation-feasibility score. The study-defined 70% benchmark is reported with an appropriate explanation of its basis. Qualitative feedback is used

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			to identify implementation constraints and potential refinements.
Evaluation and Refinement	Review the pilot findings and refine the model to improve operational feasibility and contextual suitability.	Integration of qualitative findings, descriptive questionnaire results, implementation observations, and documented expert feedback.	The final model includes traceable revisions that respond to identified needs, expert recommendations, and pilot-test findings. Changes to the implementation sequence, coordination arrangements, and knowledge-sharing mechanisms are explicitly documented.

RESULT AND DISCUSSION

Conditions of Inter-School Collaboration

The needs analysis involved eight respondents: four school principals and four teacher representatives from SMA Negeri 1 Malang, SMA Negeri 5 Malang, SMA Surya Buana Malang, and SMA Nasional Malang. The records indicate that knowledge exchange took place through subject-teacher working groups (MGMP), teacher discussions, supervisory meetings, joint activities, and digital communication. However, these practices were not consistently integrated into an institutional mechanism for documenting, disseminating, and sustaining pedagogical practices. Collaboration patterns varied across the schools. Respondents from SMA Negeri 1 Malang identified professional forums and supervisory facilitation as channels for exchange. Those from SMA Negeri 5 Malang reported that a dedicated, sustained public–private collaboration program had not yet been established. SMA Surya Buana reported sharing activities and professional interaction, while SMA Nasional expressed openness to practices developed elsewhere but continued to rely partly on personal relationships. Overall, the findings indicate uneven and incompletely institutionalized collaboration rather than a complete absence of inter-school exchange.

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Barriers and Enabling Conditions for Collaboration

The principal barriers included limited time and administrative workload, differences in institutional priorities, the absence of a sustained cross-school collaboration mechanism, dependence on personal networks, and fragmented documentation of professional knowledge. Respondents also emphasized that practices from other schools needed to be adapted to the needs and characteristics of the receiving institution. Enabling conditions included leadership support, MGMP, supervisory facilitation, and the willingness of some schools to exchange and adapt good practices.

Table 2. Summary of Collaboration Barriers and Implications for Model Development

Dimension	Key finding	Implication for the model
Coordination and governance	A dedicated and sustained public–private collaboration mechanism was not consistently available.	Establish regular forums and clarify roles.
Professional networks	Interaction occurred through MGMP, discussions, and specific activities, but continuity varied.	Strengthen cross-school forums and Professional Learning Communities (PLCs).
Knowledge management	Materials and experiences were shared directly or digitally without an integrated shared repository.	Develop a shared repository for documentation and access.
Time and priorities	Administrative workloads, differing schedules, and varied school needs constrained coordination.	Combine scheduled synchronous meetings with asynchronous exchange.
Trust and adaptation	Expert feedback highlighted concerns about competition and trust; external practices required contextual adaptation.	Introduce trust-building and contextual adaptation before joint implementation.

Model Development and Design Traceability

The needs analysis informed four core model components: cross-school collaboration forums, PLCs for sustained professional interaction, a shared digital repository, and a facilitative role for the regional branch of the education office (Cabang Dinas Pendidikan). School principals were positioned to provide institutional support; vice-principals and curriculum coordinators to

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coordinate activities; and teacher leaders to facilitate the exchange and adaptation of pedagogical practices. Expert feedback from the first Delphi round highlighted the need to establish trust before schools initiated joint programs. Accordingly, the model comprised four phases: (1) trust-building, (2) communication-network development, (3) implementation of collaborative programs, and (4) sustainability evaluation. Pilot feedback about time constraints informed a hybrid arrangement combining monthly synchronous meetings with asynchronous exchange through the digital repository.

Table 3. Traceability from Identified Needs to Design Decisions

Need or feedback	Design component	Design decision
Discontinuous interaction	Cross-school forums and PLCs	Provide regular opportunities for interaction and joint professional learning.
Fragmented knowledge documentation	Shared digital repository	Enable storage, access, and asynchronous exchange of materials.
Concerns about competition and trust	Trust-building phase	Prioritize trust-building before joint programs.
Time constraints and conflicting schedules	Hybrid collaboration arrangements	Combine monthly meetings with asynchronous exchange.

Expert Review and Limited Pilot Test

The expert review involved four experts holding doctoral degrees: two specialists in management and two in education. Across the two Delphi rounds, the reported mean percentage rating was 86.4%. Because individual expert scores and round-specific consensus criteria were not available in the summary records, this figure is treated as a descriptive summary of expert ratings rather than a verified Delphi consensus coefficient. The three-month pilot involved 16 participants from the four schools and the regional education authority. The ten-item questionnaire used a four-point Likert scale. Based on the supplied participant-level totals, the aggregate score was 524 out of a maximum of 640, equivalent to 81.875% and rounded to 81.9%. This score represents participants' ratings of implementation feasibility; it does not independently demonstrate causal effectiveness or a reduction in inter-school isolation. Pilot

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records also reported emerging cross-school PLC initiatives, although their long-term continuity requires further monitoring.

Table 4. Summary of Expert Review and Pilot-Test Results

Evaluation component	Participants and instrument	Result	Interpretation
Expert review	Four doctoral-level experts; two-round Delphi process	Mean rating: 86.4%	Descriptive summary of expert ratings; formal consensus requires documented criteria and round-specific results.
Pilot implementation assessment	16 participants; 10 items; four-point Likert scale	524/640 = 81.875%, rounded to 81.9%	Aggregate participant-rated implementation-feasibility score.
Implementation constraints	Participant feedback and pilot records	Time and schedule constraints reported	Informed the proposed combination of synchronous meetings and asynchronous repository use.
Early collaborative activity	Pilot documentation	Cross-school PLC initiatives reported	Preliminary process observation; long-term continuity has not been established.

DISCUSSION

Institutional Fragmentation as a Problem of Collaborative Organization

The findings indicate that the main challenge across the four participating senior high schools is not the complete absence of collaboration, but the limited institutionalization of existing knowledge-sharing practices. Teachers and school leaders exchange information through MGMP, professional discussions, supervisory meetings, joint activities, and digital communication. However, these channels do not consistently provide sustained coordination,

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shared documentation, or systematic adaptation of pedagogical practices. Collaboration also varies across the schools: respondents from SMAN 1 Malang described exchanges supported by professional forums and supervisory relationships, while respondents from SMAN 5 Malang reported that a dedicated, sustained public private collaboration program had not been established. Respondents from SMA Surya Buana and SMA Nasional described external knowledge-sharing and openness to adapting practices, but also identified the need for more continuous and integrated arrangements.

This pattern is consistent with research showing that teacher collaboration varies in depth and purpose and is shaped by individual, group, organizational, and structural conditions (Arar et al., 2026; Gerdes, 2022; Yuan, 2018). Participation in a professional forum, therefore, should not automatically be equated with substantive collaborative learning. Knowledge exchange becomes more meaningful when teachers jointly examine instructional problems, evaluate practices, test alternatives, and reflect on their application. Respondents also identified limited time, administrative workload, differing institutional priorities, and the need to adapt external practices to local conditions. Expert feedback raised concerns about mistrust and perceived competition. Together, these findings suggest that fragmentation is a coordination and relationship-building problem, not necessarily an indication that schools lack pedagogical innovation. The evidence does not establish that these constraints are equally pronounced across all four schools or that they have directly caused measurable differences in educational quality.

This distinction matters for model development. If existing exchanges are treated as evidence that collaboration is already fully functional, the need for coordination and continuity may be underestimated. Conversely, describing the schools as completely isolated would overlook the professional relationships and collaborative channels already in use. The model therefore seeks to strengthen and connect existing practices, while creating clearer arrangements for continuity, documentation, and reciprocal learning.

Collaborative Governance and Trust as Enabling Conditions

The Educational Transformation Ecosystem Model responds to these issues by assigning complementary responsibilities to the regional education authority, school leaders, curriculum coordinators, and teacher leaders. This arrangement reflects collaborative governance, which emphasizes structured collective action, institutional design, leadership, participation incentives, dialogue, and trust-building (Äärelä, 2018; Griffiths, 2021; Liu, 2021). In the proposed model, the

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Cabang Dinas Pendidikan facilitates connections and coordination; principals authorize and support participation; curriculum coordinators organize activities; and teacher leaders contribute to professional learning and the exchange of pedagogical knowledge. This distribution links administrative coordination with teacher-level participation rather than concentrating collaboration in a single actor.

Trust-building was placed at the beginning of the implementation sequence because expert feedback identified concerns about competition and mistrust between institutions. This phase is intended to establish shared expectations, clarify reciprocal benefits, and agree on how teaching materials and professional knowledge can be shared. It also allows collaboration to begin with manageable activities before progressing to more demanding joint work. This design is compatible with the emphasis on dialogue, commitment, and incremental achievements in collaborative governance (Holmström, 2023; Mora-Ruano, 2018; Pan, 2024; Schuster, 2021). Nevertheless, the pilot did not establish a measurable increase in trust; trust-building should therefore be regarded as a theoretically informed design component requiring further evaluation.

The findings also show that collaborative arrangements must account for practical constraints. Participants identified workload and non-aligned schedules as barriers to regular participation. Accordingly, collaboration requires more than formal commitments: it also needs clear responsibilities, predictable schedules, leadership support, and feasible opportunities for teachers to contribute. The model's combination of monthly synchronous forums and asynchronous repository-based exchange was designed to respond to these constraints. Its practical value will depend on whether these arrangements can be sustained within schools' existing operational demands. Institutions should also perceive the network as reciprocal, allowing all participants to contribute expertise and benefit from shared learning rather than positioning one school as the sole source of innovation.

From Professional Networks to Structured Knowledge Diffusion

The needs analysis indicates that pedagogical knowledge already circulates through interpersonal relationships, MGMP, professional discussions, and digital channels. However, the lack of an integrated documentation system can make knowledge difficult to preserve and access beyond the immediate participants. Research on teachers' professional networks similarly shows that policy and organizational arrangements influence whom teachers consult and what

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knowledge resources are available to them (Mehto, 2020; Mylius, 2018; So, 2021; Somani, 2021). Knowledge diffusion consequently depends not only on the quality of an innovation but also on the relationships and arrangements through which it is shared.

The model connects recurring collaborative forums, cross-school Professional Learning Communities (PLCs), and a shared digital repository. Forums provide opportunities to present practices and discuss instructional challenges; PLCs are intended to support continuing professional interaction; and the repository enables teaching materials to be documented and retrieved between meetings. This design reflects literature emphasizing the role of organizational conditions in professional learning communities and the different depths of teacher collaboration (Blömeke, 2021; Jong, 2019, 2022). Importantly, the model treats diffusion as more than transferring materials. Teachers are expected to evaluate the relevance of a practice, understand its pedagogical rationale, adapt it to the receiving school's context, and document lessons from implementation.

The repository alone cannot ensure meaningful knowledge exchange. Its value depends on whether teachers can locate relevant resources, understand their intended use, discuss limitations, and receive feedback when adapting them. The combination of synchronous forums and asynchronous access is intended to support this work while accommodating scheduling constraints. To remain useful, the repository also requires clear procedures for contributing, describing, updating, and retrieving resources, as well as appropriate arrangements for attribution and access. In this design, digital infrastructure supports professional interaction rather than replacing it (Patrick, 2022; Wilhelmsen, 2019). Pilot documentation reports the emergence of cross-school PLC initiatives, providing an initial indication that interaction may extend beyond one-off activities. However, available records do not establish their duration, frequency, instructional depth, or long-term continuity. These observations should therefore be treated as preliminary process findings rather than proof of sustained knowledge diffusion.

Theoretical Contribution: Linking Governance, Networks, and Innovation Diffusion

The theoretical contribution of the model lies in its operational connection of collaborative governance, knowledge-sharing networks, and innovation diffusion—not merely in combining three theories. Collaborative governance explains how actors coordinate responsibilities and establish conditions for collective action (Bryant & Walker, 2024; Granrud, 2019; Pino-Yancovic, 2020), network research highlights how relationships and organizational

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arrangements shape access to professional knowledge (Demetroulis, 2023; Hulme, 2023), and diffusion theory addresses how practices are communicated and adopted within a social system (Schnellert & Butler, 2021). Each perspective illuminates a different part of cross-institutional knowledge exchange.

The model links these perspectives through a sequence of governance coordination, trust-building, recurring professional interaction, knowledge documentation, contextual adaptation, and sustainability review. This sequence offers a context-specific design proposition: knowledge diffusion may be supported when institutional coordination, professional relationships, shared infrastructure, and opportunities for adaptation operate together. It also helps explain why the presence of innovation within individual schools does not necessarily result in its wider circulation. Governance provides the conditions for participation; professional networks create opportunities to encounter and discuss practices; and diffusion-related activities enable schools to assess and adapt those practices to their own settings.

The four-school study and three-month pilot, however, do not establish the causal contribution or relative importance of each mechanism, nor do they compare the model with alternative arrangements. The model should therefore be understood as an empirically informed, preliminarily assessed framework whose proposed mechanisms warrant further testing. Its potential theoretical value lies in specifying relationships among established concepts in a practical sequence that can be examined in later DBR cycles.

Implications for Educational Governance and School Leadership

For educational governance, the findings suggest that the regional education authority could facilitate regular pedagogical exchange between public and private schools by clarifying responsibilities, supporting a recurring agenda, and connecting institutions with complementary interests. School leaders can reinforce this arrangement by allocating time, identifying teacher leaders, integrating collaboration into school development plans, and recognizing contributions to cross-school learning. Such support is needed to make participation predictable without diminishing schools' autonomy (Bates, 2019; Bohnenkamp, 2023; Myende, 2022; Vidergor, 2021).

Professional forums and PLCs should prioritize joint inquiry into teaching practices rather than material exchange alone. Activities may include examining instructional challenges, discussing assessment approaches, adapting lesson plans, and reflecting on implementation. The shared repository can support this process by storing resources and recording adaptations, with

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clear arrangements for access, attribution, maintenance, and protection of school or student information. Implementation should remain incremental: trust-building and clarification of mutual benefits should precede more demanding joint programs, with practices adapted to each school's priorities and conditions. For monitoring purposes, participating institutions could track whether meetings occur as planned, whether teachers contribute and retrieve resources, whether shared practices are adapted and implemented, and whether PLC activity continues after the pilot. These indicators would provide more direct evidence of implementation and sustainability than a single aggregate rating. The model should thus be used as a framework for organizing and evaluating collaboration, not as a guarantee of educational quality equilibrium. Its broader value will depend on evidence of improved access to knowledge, deeper professional interaction, adaptation of pedagogical practices, and sustained collaboration.

Limitations and Directions for Future Research

This study involved four purposively selected senior high schools in one city, eight needs-analysis respondents, four doctoral-level experts, and 16 pilot participants over three months. These data informed the development and preliminary assessment of the model but do not establish its applicability to other regions, school levels, or institutional settings. Future studies should evaluate the model in a wider range of schools and over longer periods. The pilot score of 81.9% was calculated from 16 participant-level totals on a ten-item, four-point Likert questionnaire. Because the items cover related but distinct aspects of governance, knowledge exchange, implementation, and perceived diffusion, the aggregate score should be interpreted cautiously as a participant-rated implementation assessment, not as a validated unidimensional measure or evidence of causal effectiveness. Future evaluations should distinguish feasibility, acceptability, implementation quality, and perceived usefulness through clearly defined indicators and appropriate instrument validation.

The expert-review score of 86.4% represents the reported mean percentage of expert ratings. Individual scores, round-specific distributions, and an explicit numerical consensus criterion were not available in the reviewed records. The score therefore supports a descriptive account of expert appraisal but is insufficient on its own to demonstrate formal Delphi consensus. Future reporting should document rating procedures, consensus criteria, changes between rounds, and the rationale for any thresholds. Finally, the pilot did not include a verified pre–post measure of institutional isolation, a comparison group, or longitudinal evidence of sustained

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adoption. It therefore cannot establish that the model reduced competition, improved student outcomes, or narrowed educational disparities. Subsequent research could track meeting frequency, participation continuity, the quality and use of shared resources, practice adaptation, PLC sustainability, and changes in teacher networks. Comparative or longitudinal DBR studies could then examine which model components are most useful under different institutional conditions and whether knowledge exchange leads to durable changes in teaching practice.

CONCLUSION

This study developed an Educational Transformation Ecosystem Model to strengthen knowledge diffusion between public and private senior high schools in Malang City. Findings from four schools revealed that knowledge exchange occurred through professional forums, teacher discussions, supervisory networks, joint activities, and digital communication, but lacked sustained institutional coordination. Key barriers included limited time, fragmented coordination, differing institutional priorities, and inadequate knowledge-sharing infrastructure. The model integrates collaborative governance, knowledge ecosystems, and diffusion of innovation through four phases: trust-building, communication-network development, collaborative-program implementation, and sustainability evaluation. Its main components include regional education authority facilitation, school leadership support, cross-school Professional Learning Communities (PLCs), collaborative forums, and a shared digital repository. This framework connects governance, professional interaction, and knowledge documentation to support cross-institutional learning.

Four doctoral-level experts assessed the model, yielding a mean rating of 86.4%. A three-month pilot involving 16 participants produced an implementation-assessment score of 81.9%. These findings provide preliminary evidence of expert appraisal and implementation feasibility. Although cross-school PLC initiatives emerged, their sustainability and contribution to pedagogical improvement require further evaluation. This study offers a context-specific framework for organizing knowledge exchange across schools. However, its findings are limited by the four-school setting and short implementation period. Further research involving more institutions, longer observation, and systematic outcome measures is needed to assess the model's effectiveness and broader applicability.

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FUTURE DIRECTIONS

The model requires sustained support from regional education authorities and school leaders, structured cross-school Professional Learning Communities (PLCs), and a shared digital repository to facilitate reciprocal knowledge exchange and contextual adaptation of pedagogical practices. Future research should involve more schools, longer implementation periods, and systematic outcome measures to assess feasibility, collaboration quality, and long-term educational impact. Subsequent Design-Based Research cycles should also improve documentation of design decisions, expert feedback, and evaluation procedures to strengthen the model's reliability and applicability.

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