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Disseminating a Smart Learning Pedagogical Model for Sustainable Innovation in Higher Education

Sitti Fatimah Sangkala Sirate [1 *], Misykat Malik Ibrahim [2], Erwin Hafid [3], Amrah Kasim [4], Muhammad Yaumi [5]

[1] STKIP YPUP Makassar, Indonesia, 0000-0002-2627-8049
[2] Universitas Islam Negeri Alauddin Makassar, Indonesia, 0000-0002-9399-8273
[3] Universitas Islam Negeri Alauddin Makassar, Indonesia, 0000-0002-2180-6949
[4] Universitas Islam Negeri Alauddin Makassar, Indonesia, 0000-0003-1907-0204
[5] Universitas Islam Negeri Alauddin Makassar, Indonesia, 0000-0002-9848-911X
Corresponding author: Sitti Fatimah Sangkala Sirate (fatimahsirate@ypup.ac.id)

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Abstract

This study investigates how a Smart Learning Pedagogical Model was disseminated, adopted, and sustained at the YPUP Institute of Teacher Education, Indonesia (YIT-EDU) using a mixed-method dissemination research design. The study aimed to explore the mechanisms of dissemination and the level of acceptance among lecturers and students. Data were collected from 120 participants through surveys, interviews, focus group discussions, and document analysis. The findings revealed that dissemination at YIT-EDU evolved through five interconnected stages described in the DUCASIF Model—Dissemination for Understanding, Comprehension, Action, Sustainability, and Institutional Feedback. The model shows that dissemination is not a linear process of information transfer but a cyclical system of institutional learning driven by collaboration, feedback, and reflection. Quantitative results indicated high acceptance of the Smart Learning Pedagogical Model, particularly in terms of relative advantage, compatibility, and observability, while complexity remained moderate. Qualitative findings further demonstrated that lecturers' participation, peer mentoring, and leadership support were critical to sustaining innovation. Theoretically, the DUCASIF framework extends the Diffusion of Innovation theory by integrating sustainability and institutional feedback as continuous renewal mechanisms. Practically, it offers a roadmap for higher-education institutions seeking to embed smart learning into their pedagogical systems. This study concludes that effective dissemination depends on reflective institutional practices that transform innovation into a self-sustaining educational culture.

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Introduction

The integration of digital technologies and data-driven systems has reshaped how teaching and learning take place in higher education. The rapid growth of artificial intelligence (AI), learning analytics, and mobile learning environments has encouraged universities to adopt smart learning as a new pedagogical paradigm that promotes flexibility, personalization, and sustainability in learning (Kong & Song, 2023; Mustafa et al., 2024). Within this paradigm, technology serves not merely as a tool but as an adaptive system that continuously supports learners' needs and provides feedback for improvement. Smart learning has therefore evolved from e-learning and blended learning into a more intelligent ecosystem that connects pedagogy, technology, and data to support meaningful learning experiences (García-Tudela et al., 2021; Ghanem & hassan Alammary, 2025).

Despite the growing global commitment to smart learning, many higher-education institutions—particularly in developing contexts—still face challenges in disseminating and sustaining such innovations (Anutariya et al., 2023; Chen & Liu, 2024). While pilot programs and isolated projects have demonstrated success, the transition from experimentation to institutional practice remains limited. Dissemination often ends at the awareness level, without sufficient mechanisms for building comprehension or translating innovation into sustainable pedagogical models. As a result, the implementation of smart learning frequently depends on individual champions rather than institutional systems (Dearing & Singhal, 2020; Wajid, 2025). This gap highlights the need for models that not only promote technology adoption but also explain how innovations are communicated, internalized, and institutionalized across higher-education ecosystems.

Previous studies have widely employed Rogers' Diffusion of Innovation Theory to explain how individuals adopt educational technologies (Wurster et al., 2024; Rogers, 2010). However, dissemination in institutional contexts involves more than diffusion—it requires deliberate strategies that build awareness, understanding, and action among diverse stakeholders (Azadifar et al., 2025). Similarly, Roblyer (2018) technology integration framework emphasizes that true integration occurs when educators move from procedural to principle knowledge, where technology use becomes pedagogically meaningful. While these theories offer valuable insights, there remains a lack of integrative frameworks that connect dissemination mechanisms with sustainable pedagogical innovation. This study addresses this gap by analyzing how a Smart Learning Pedagogical Model was disseminated, adopted, and sustained within a higher-education context, focusing on both the mechanisms of dissemination and the degree of acceptance achieved. Guided by the theoretical perspectives of Rogers and Roblyer, the study develops the Dissemination for Understanding–Comprehension–Action–Sustainability–Institutional Feedback (DUCASIF) Model**,** which conceptualizes dissemination as a cyclical institutional learning process rather than a linear communication sequence. The DUCASIF framework explains how innovation evolves through interconnected stages of awareness, collaborative experimentation, application, sustainability, and feedback—bridging the gap between diffusion, pedagogical integration, and long-term institutional renewal.

The findings contribute to the expanding scholarship on smart learning and digital pedagogy by providing both theoretical and practical insights. Theoretically, the DUCASIF Model extends diffusion theory by embedding dissemination within a continuous cycle of organizational reflection and adaptation. Practically, it offers a

structured framework for higher-education institutions to design, implement, and sustain smart learning initiatives through feedback-driven improvement. By doing so, this study positions dissemination as a strategic mechanism for achieving sustainable pedagogical innovation in higher education.

Literature Review

Smart Learning and Pedagogical Innovation

The evolution of smart learning represents a paradigm shift in higher education from technology-assisted instruction to adaptive, data-driven, and context-aware learning systems. Smart learning environments (SLEs) integrate artificial intelligence (AI), analytics, and mobile technologies to provide personalized learning experiences that respond to learners' needs in real time (Zhu et al., 2016; Singh, 2022). Unlike traditional e-learning, which focuses primarily on content delivery, smart learning emphasizes *pedagogical intelligence*—how data and digital tools can support self-regulated, collaborative, and sustainable learning processes (Popenici & Kerr, 2017).

The current research shows that smart learning systems are increasingly viewed as ecosystems rather than discrete technologies, where pedagogy, technology, and data interact to form adaptive learning cycles. C. Chen & Xiao (2025) demonstrated that successful smart learning environments depend not only on technological readiness but also on pedagogical innovation and teacher competence. Similarly, Benita et al. (2021) proposed a smart learning ecosystem framework that situates innovation within institutional contexts, emphasizing that sustainable transformation requires leadership, professional learning, and curriculum redesign. In this sense, smart learning can be seen as both a pedagogical reform and a catalyst for institutional change in higher education.

Dissemination and Diffusion in Educational Innovation

While innovation diffusion has been widely studied in education, dissemination involves a more deliberate and structured process. According to Rogers (2010), diffusion refers to the natural spread of new ideas within a social system, whereas dissemination requires systematic efforts to communicate, support, and institutionalize those innovations. Dearing & Singhal (2020) highlight that dissemination depends on communication channels, leadership engagement, and contextual alignment.

Within higher education, dissemination often fails to move beyond pilot stages due to fragmented communication and lack of sustained support. L'Hotta et al., (2024) found that effective dissemination of digital pedagogy requires collaborative frameworks among teachers, administrators, and policymakers. Their findings show that institutional collaboration, rather than individual enthusiasm, drives the long-term success of educational innovations. In this context, dissemination becomes not only a technical process of introducing new tools but also a socio-organizational process of cultivating shared understanding and practice (Yaumi, 2024).

Pedagogical Models for Technology Integration

Pedagogical frameworks play a central role in determining how technology is adopted and used meaningfully.

Roblyer (2018) proposed a model of technology integration that connects theoretical knowledge with practical teaching design, emphasizing that technology integration should be guided by pedagogical purpose rather than novelty. The model suggests that teachers progress through stages—from understanding technology as a tool to using it as a cognitive partner that transforms learning experiences (Akram et al., 2021; Zou et al., 2025).

Recent studies have extended these ideas. Kellsey & Taylor-Beswick (2025) analyzed digital pedagogy models and concluded that effective integration requires a balance between technological affordances and pedagogical goals, supported by institutional leadership. The TPACK (Technological Pedagogical Content Knowledge) framework (Jibril & Afolake, 2024) and the SAMR (Substitution, Augmentation, Modification, Redefinition) model also complement Roblyer and Hughes's perspective by providing layered views of how technology reshapes teaching (Tan et al., 2025).

Sustainability of Innovation in Higher Education

Sustainability in educational innovation refers to the ability of institutions to maintain, adapt, and institutionalize changes beyond the initial implementation phase. It requires systems thinking that integrates policy, leadership, and continuous capacity building (Christou et al., 2024). Research consistently shows that innovations fail not because of a lack of technology but because of insufficient mechanisms for maintaining pedagogical coherence, institutional commitment, and ongoing professional learning (Ilomäki & Lakkala, 2018).

Shih and Chang (2020) highlighted that sustained innovation depends on collaborative professional learning networks among educators. These networks create ongoing cycles of reflection and knowledge sharing that strengthen teachers' digital competence and pedagogical adaptability. Similarly, Shih & Chang (2020) found that sustainable smart learning ecosystems depend on three elements: institutional readiness, leadership vision, and the ability to transform innovation into standard practice.

Integrative Theoretical Perspective: Diffusion Meets Pedagogical Sustainability

The intersection between diffusion theory and pedagogical integration provides a conceptual bridge for understanding how educational innovations evolve into sustainable institutional practice. Roger's (2010) *Diffusion of Innovation Theory* explains the attributes that influence adoption—relative advantage, compatibility, complexity, trialability, and observability—while Roblyer's integration framework emphasizes how technology becomes embedded within pedagogy and organizational systems (Roblyer, 2018). Integrating these two perspectives allows dissemination to be viewed as both a communicative and a pedagogical process.

In this study, these frameworks converge in the Dissemination for Understanding–Comprehension–Action–Sustainability–Institutional Feedback (DUCASIF) Model**.** The model conceptualizes dissemination as a continuous institutional learning cycle. The model explains how innovation develops through stages of awareness, collaborative engagement, implementation, sustainability, and reflective feedback—demonstrating that dissemination is not a one-time process but an evolving mechanism for institutional renewal and pedagogical sustainability.

Method

Research Design

This study adopted a dissemination research design aimed at analyzing how a smart learning pedagogical model was introduced, communicated, and sustained within higher education. Dissemination research seeks to understand how educational innovations spread, what factors influence their adoption, and how they can be embedded within institutional systems (Feuerstein et al., 2022). The design followed a convergent mixed-methods approach, integrating both qualitative and quantitative data to capture the mechanisms and acceptance of dissemination from multiple perspectives (Neta et al., 2021).

The theoretical foundation combined Rogers' diffusion of innovation theory and Roblyer's Technology Integration Framework. This integration allowed the study to examine dissemination as both a communicative and pedagogical process—bridging the gap between innovation adoption and sustainable pedagogical change. The research focused on two central questions:

1. How is the Smart Learning Pedagogical Model disseminated through the stages of understanding, comprehension, and action within higher education institutions?
2. To what extent is the dissemination of the Smart Learning Pedagogical Model accepted and sustained among lecturers and students in higher education?

Research Context and Participants

The study was conducted at YPUP Institute of Teacher Education (YIT-EDU), a private teacher education institution in Eastern Indonesia, which implemented a Smart Learning Classroom initiative supported by the Ministry of Higher Education during the 2023/2024 academic year. The institution was selected based on its readiness to adopt digital learning innovations and its active engagement in pedagogical reform.

Participants included 120 respondents comprising 40 lecturers and 80 students from three departments—English Education, Mathematics Education, and Physical Education. All participants had used smart learning tools for at least one semester and were directly involved in teaching or learning processes using the new pedagogical model. Academic leaders were also interviewed to provide institutional insights into the dissemination mechanisms and policy support.

Instruments and Data Collection

Multiple instruments were used to ensure methodological triangulation.

- Quantitative data were collected through structured questionnaires adapted from previous DOI- and TAM-based studies (Ifinedo et al., 2019; Overbye-Thompson & Hamilton, 2025). The questionnaire measured seven constructs: relative advantage, compatibility, complexity, trialability, observability, perceived usefulness, and perceived ease of use. Responses were rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree).
- Qualitative data were obtained through semi-structured interviews, focus-group discussions (FGDs), and

classroom observations. Interviews and FGDs explored participants' perceptions of dissemination activities, institutional communication, and pedagogical change (Prosina et al., 2024). Institutional documents, including workshop reports, curriculum guidelines, and policy memos, were analyzed to validate the data and identify dissemination patterns.

All instruments were validated by three experts in educational technology and piloted with 20 participants. The questionnaire achieved Cronbach's alpha of 0.83, indicating high internal reliability. Interview protocols were reviewed for content validity and coherence with the research questions.

Data Analysis Procedures

A convergent mixed-methods strategy was used, where quantitative and qualitative findings were analyzed separately and then merged for interpretation.

- Quantitative data were analyzed using descriptive statistics to determine mean scores for each construct and identify the overall level of dissemination acceptance. The analysis emphasized patterns rather than inferential comparisons to align with the descriptive–exploratory intent of dissemination research (Clark-Carter, 2024).
- Qualitative data were analyzed thematically, following the procedures of Miles et al. (2014): data condensation, data display, and conclusion drawing. Codes were developed inductively from interview transcripts and observation notes, focusing on patterns of understanding, comprehension, and action.

Triangulation was achieved by comparing data from questionnaires, interviews, FGDs, and documents. This ensured validity through the convergence of multiple data sources. Member checking was also conducted by sharing preliminary results with participants to confirm accuracy and credibility (Marlina et al., 2025).

Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board of YIT-EDU (Protocol No. 2025-EDTECH-001). All participants provided informed consent and were assured that their data would remain confidential and used solely for research purposes. Participation was voluntary, and respondents could withdraw at any stage without penalty.

Throughout the study, ethical research standards were maintained following the American Educational Research Association (AERA) Ethical Guidelines, including respect for participant autonomy, institutional integrity, and responsible data management (Austin & Medina Riveros, 2025).

Findings

Overview of Dissemination Process

The dissemination of the Smart Learning Pedagogical Model at YIT-EDU evolved as a cyclical institutional learning process involving communication, collaboration, and reflection. Dissemination was not treated merely as an administrative activity or a technological rollout; instead, it became a structured process of collective

meaning-making and pedagogical transformation. Field data obtained through interviews, focus group discussions, surveys, and observations showed that dissemination occurred in interrelated phases that extended beyond simple adoption, culminating in sustainability and continuous institutional feedback.

The institutional effort to promote smart learning began as a strategic initiative from the leadership and grew into a participatory movement led by lecturers and students. Dissemination was facilitated by the Smart Learning Task Force, which served as a mediator between policy direction and classroom implementation. The process unfolded in five empirically identified phases: Understanding, Comprehension, Action, Sustainability, and Institutional Feedback. Together, these stages formed an integrated framework called the DUCASIF Model**,** representing the continuous institutional learning cycle that sustains pedagogical innovation.

- **D** – Dissemination for …
- **U** – Understanding
- **C** – Comprehension
- **A**– Action
- **S** – Sustainability
- **IF**– Institutional Feedback

Together, these phases form a recursive and adaptive cycle that sustains educational innovation within higher education institutions.

Mechanisms of Dissemination

Dissemination for Understanding

The first stage focused on developing awareness and a shared conceptual foundation among academic leaders, lecturers, and students. Dissemination was initiated through coordination meetings, internal circulars, and structured workshops introducing the principles of smart learning and its relevance to higher education pedagogy. Observations revealed that initial participation was primarily informational. Most lecturers attended the introductory sessions, but engagement remained limited to technical demonstrations. One lecturer reflected, *"We knew what smart learning meant in theory, but it still felt distant from our daily teaching reality."* Despite this, the institutional communication successfully built a collective sense of direction. Memos and faculty briefings emphasized that smart learning was not optional—it was to become a part of institutional identity.

By the end of this phase, more than 80% of lecturers had attended at least one institutional workshop, and several departments began reviewing course syllabi to align them with smart learning guidelines. The Understanding phase thus created the foundation for awareness and policy alignment, setting the tone for further engagement.

Dissemination for Comprehension

The comprehension stage marked the transition from awareness to participatory experimentation. During this phase, dissemination became hands-on and collaborative. Lecturers and students engaged in pilot projects designed to test smart learning principles within real classroom environments.

Peer mentoring emerged as the central mechanism driving comprehension. Lecturers formed small groups to redesign lesson plans, experiment with multimedia integration, and share teaching experiences. As one lecturer explained, *"When we started trying it ourselves, it became clearer. We learned more from our peers than from formal training."* Observation data confirmed that lecturers frequently exchanged teaching materials and LMS templates, which accelerated understanding through collective practice.

Students also played an active role. They provided feedback during pilot sessions, helping lecturers evaluate the accessibility and effectiveness of digital materials. One student commented, *"We liked having materials online; it made us more responsible for managing our time."*

By the end of this stage, 75% of lecturers had redesigned at least one course using smart learning tools. The dissemination for comprehension thus reflected a participatory and reflective culture—where knowledge was not transmitted but co-constructed through experimentation and feedback.

Dissemination for Action

The action stage reflected the institutionalization of comprehension into pedagogical practice. Dissemination now took the form of self-initiated innovation. Lecturers began implementing the Smart Learning Pedagogical Model across departments without external prompting.

Institutional records showed a substantial expansion of smart learning implementation—from 12 courses in the first semester to 31 by the following year. The Smart Learning Task Force shifted its role from facilitator to consultant, as lecturers and departments started generating their own innovations. *"We no longer waited for directives,"* said one lecturer. *"We now decide what to improve and how to make it fit our context."*

Observations revealed that dissemination at this stage was characterized by ownership and autonomy. Lecturers organized peer reviews of their smart classes, and some developed analytics dashboards to monitor student performance. Students' engagement also increased—attendance in blended sessions rose to over 80%, and the completion rate for online tasks surpassed 70%.

This stage represented the transformation of dissemination into a cultural norm. Smart learning had moved from pilot testing to everyday practice, becoming part of the academic ecosystem at YIT-EDU.

Dissemination for Sustainability

The sustainability stage extended dissemination beyond implementation. Once smart learning practices were established, the institution focused on maintaining momentum and embedding innovation into long-term structures. Sustainability was achieved through policy integration, resource allocation, and continuous professional development.

Institutional documents indicated that smart learning principles were formally adopted in the 2024/2025 academic

guidelines. The Rector's directive required all departments to include at least one smart course per semester. Mentoring systems were institutionalized to ensure continuity, and senior lecturers were appointed as facilitators for new staff.

Lecturers demonstrated ongoing commitment through reflective activities such as lesson study sessions, student feedback analysis, and course improvement plans. *"Every semester we discuss what worked and what didn't,"* one lecturer said. *"It's now part of our teaching cycle."*

The sustainability phase thus ensured that dissemination was not a temporary project but a continuing institutional practice. It represented the stage where smart learning became part of organizational culture—maintained through policy, practice, and shared accountability.

Dissemination with Institutional Feedback

The final phase identified from field data was the establishment of institutional feedback as a reinforcing mechanism for sustainability. Feedback operated through systematic evaluation processes at both department and university levels.

The Smart Learning Task Force coordinated data collection on teaching performance, student participation, and course analytics. These reports were reviewed quarterly to identify areas for improvement. The data showed that departments used these insights to adjust their instructional strategies, update materials, and refine dissemination activities.

One academic leader explained, *"Institutional feedback closes the loop. Without it, innovation would stop after adoption. Feedback helps us evolve every semester."* Evidence from reports showed a cycle of renewal—where results from one semester informed the design of the next.

Institutional feedback not only maintained the quality of dissemination but also inspired new initiatives. For example, the Mathematics Education Department began developing an internal research group to study smart learning outcomes. This demonstrates that feedback had evolved from mere evaluation into a driver of institutional learning.

Level of Dissemination Acceptance

Quantitative Findings

Quantitative data were analyzed to measure participants' perceptions of the dissemination of the Smart Learning Pedagogical Model across five key dimensions derived from the diffusion attributes: relative advantage, compatibility, complexity, trialability, and observability. Table 2 presents the descriptive results of dissemination acceptance based on responses from 120 lecturers and students involved in the program.

Table 1. Descriptive Results of Dissemination Acceptance

No	Dimension of Dissemination Acceptance	Indicator Description	Mean (M)	Std. Deviation (SD)	Interpretation
1	Relative Advantage	The perceived improvement and added pedagogical value of the Smart Learning Model compared to traditional teaching methods.	4.38	0.62	High
2	Compatibility	The degree to which the Smart Learning Model aligns with lecturers' teaching styles, institutional culture, and student needs.	4.21	0.68	High
3	Complexity	The perceived level of difficulty in understanding and operating the Smart Learning platform and its tools.	3.76	0.73	Moderate
4	Trialability	The extent to which lecturers can test and adapt the Smart Learning Model before full implementation.	4.05	0.65	High
5	Observability	The visibility of results and benefits from implementing the Smart Learning Model in teaching and learning contexts.	4.30	0.58	High
—	Overall Average	—	**4.14**	—	**High**

As shown in Table 2, participants expressed consistently high levels of agreement across most dimensions of dissemination acceptance. The highest mean scores were found in relative advantage (M = 4.38) and observability (M = 4.30), indicating that the Smart Learning Model was widely perceived as both pedagogically beneficial and visibly effective in practice. Compatibility also scored high (M = 4.21), suggesting strong alignment with existing teaching contexts. In contrast, complexity received a moderate rating (M = 3.76), reflecting that some technical aspects of the LMS still posed challenges for users.

These findings suggest that participants perceived the innovation as beneficial, aligned with their teaching practices, and visible in its impact. The moderate rating for complexity implied that certain technical barriers persisted, such as inconsistent connectivity and limited system mastery. Nevertheless, the overall perception indicated that dissemination had built substantial confidence and ownership among lecturers and students. Overall, the results indicate that dissemination efforts effectively fostered understanding, confidence, and readiness to adopt the model among lecturers and students.

Qualitative Insights

Qualitative data enriched these findings by revealing the human dimensions behind acceptance. Lecturers viewed smart learning as practical and motivating. *"The analytics help me track student activity and adjust my approach,"* one lecturer noted. Students appreciated its flexibility and transparency. *"It's easier to know what's expected and how we perform,"* said another.

Institutional commitment strengthened acceptance further. The Rector's decision to link smart learning implementation with performance evaluations encouraged long-term engagement. The creation of mentoring systems and task forces also reinforced trust and consistency.

Acceptance, therefore, was not passive compliance but an active alignment between personal values and institutional goals. Dissemination had transformed from a policy initiative into a shared belief system that connected individuals through common purpose and feedback.

Synthesis of Findings

The overall findings demonstrate that dissemination at YIT-EDU Makassar evolved into a systemic process supported by collaboration, reflection, and institutional learning. The five identified stages—Understanding, Comprehension, Action, Sustainability, and Institutional Feedback—form a coherent pattern of pedagogical transformation.

Dissemination began with awareness-building, progressed through collaborative learning, and matured into autonomous innovation supported by sustainable policy structures and feedback systems. Acceptance levels confirmed this trajectory, showing that participants recognized clear advantages and compatibility of the model, while continuous feedback ensured its refinement. Thus, dissemination became not just a method of spreading innovation but a framework for institutional learning—anchored in continuous improvement and sustained engagement.

Emergent Framework: The Dissemination for Understanding–Comprehension–Action–Sustainability–Institutional Feedback (DUCASIF) Model

Based on the integrated findings, this study identified a comprehensive dissemination framework called the Dissemination for Understanding–Comprehension–Action–Sustainability–Institutional Feedback (DUCASIF) Model. The model conceptualizes dissemination not as a one-way transfer of innovation but as a continuous institutional learning cycle in which knowledge, practice, and reflection evolve in an iterative process. It portrays dissemination as an adaptive system—driven by communication, collaboration, and feedback—that transforms innovation from awareness to institutional maturity.

The DUCASIF Model describes dissemination as a continuous and interconnected institutional learning cycle

consisting of five progressive stages. The first three stages—Understanding, Comprehension, and Action—represent the movement from awareness to active implementation. Dissemination begins with building shared understanding among institutional stakeholders through communication and workshops, progresses to collaborative meaning-making via mentoring and pilot teaching, and culminates in practical application where lecturers independently integrate smart learning principles into classroom practice. Together, these phases mark the transition from conceptual adoption to pedagogical transformation.

The next two stages—Sustainability and Institutional Feedback—ensure the long-term vitality of innovation. Sustainability embeds the Smart Learning Model into institutional policies, mentoring systems, and professional routines, while Institutional Feedback functions as a reflective mechanism that renews and refines dissemination outcomes. Through feedback loops, experiences and insights from implementation are re-disseminated to improve policies, resources, and training programs. The DUCASIF Model thus illustrates how dissemination evolves from knowledge transfer to a self-sustaining system of reflection and renewal within the higher-education context.

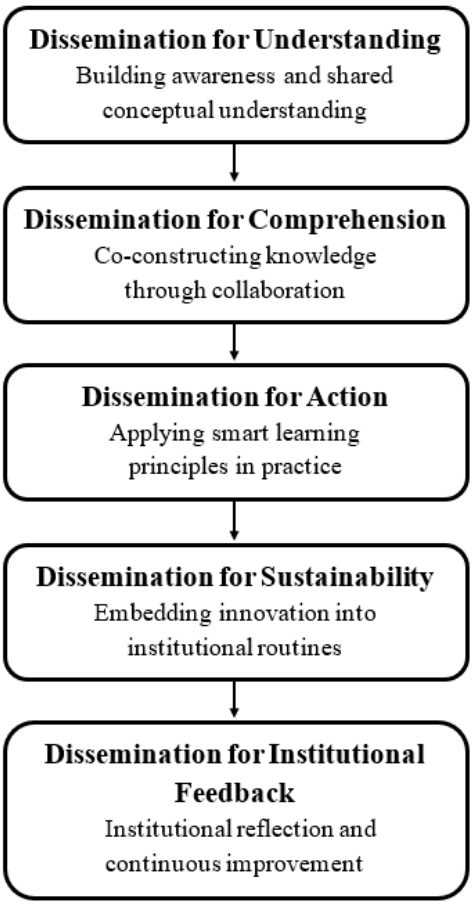

Figure 1. DUCASIF Model of Dissemination

The DUCASIF Model thus encapsulates how dissemination operates as both a pedagogical and organizational phenomenon. It illustrates that innovation in higher education thrives through cycles of communication, participation, sustainability, and feedback. The model provides a replicable framework for universities seeking to institutionalize innovation through reflective dissemination practices that connect learning, action, and renewal.

Discussion

Dissemination as Institutional Learning

The findings reveal that dissemination at YIT-EDU did not function as a one-way transfer of knowledge but as a dynamic process of institutional learning. This is consistent with the notion of *diffusion of innovation* (Rogers, 2010), which explains that adoption unfolds through progressive stages of awareness, persuasion, decision, implementation, and confirmation. Yet, the DUCASIF model observed in this study extends Rogers' framework by emphasizing that dissemination is not merely a series of steps but a *recursive learning system* within an institution.

At YIT-EDU, the dissemination process was driven by both leadership and community participation. The early phase of *Understanding* relied on structured communication through official workshops and circulars, while later phases such as *Comprehension* and *Action* relied on reflection and collaboration among lecturers. This shift from top-down communication to participatory learning shows that effective dissemination in higher education requires collective sense-making rather than compliance.

Lecturers and students at YIT-EDU gradually developed a culture of shared ownership through peer mentoring and course redesign. These practices turned dissemination into a continuous learning activity—one that mirrors the concept of organizational learning described by Dearing & Singhal (2020). The institution learned *how to learn*: revisiting its methods, refining its practices, and continuously adapting to new challenges. The DUCASIF model therefore captures how institutional learning emerges from iterative dissemination cycles that connect communication, experimentation, and reflection.

Linking Dissemination and Pedagogical Integration

The transition from *Comprehension* to *Action* stages demonstrates how dissemination transforms into pedagogical integration. Roblyer (2018) argues that meaningful technology integration occurs when educators move beyond procedural use toward conceptual alignment between technology, pedagogy, and content. The experiences at YIT-EDU show precisely this movement.

During the *Comprehension* stage, lecturers began experimenting with the Smart Learning Pedagogical Model through pilot teaching and peer mentoring. Dissemination here was not limited to sharing materials; it became a process of co-designing lessons, co-teaching, and discussing classroom evidence. These collaborative acts helped lecturers internalize the model and adapt it to diverse teaching contexts. As one participant explained during interviews, "We learned best when we shared failures and small successes together."

When dissemination reached the *Action* phase, the Smart Learning Model was no longer viewed as a project but as a pedagogical mindset. Lecturers implemented it across departments, created interactive materials, and used learning analytics to guide their teaching decisions. This transformation aligns with studies by L'Hotta et al., (2024), which highlight that innovation deepens when teachers interpret technology through their pedagogical

values rather than as external requirements.

Thus, dissemination became the bridge that connected innovation and practice. It provided the scaffolding for lecturers to move from awareness to mastery. As comprehension turned into collective expertise, dissemination ceased to be an event—it became the institution's way of constructing pedagogical meaning.

Sustainability and Institutional Feedback

A central contribution of this study is the identification of *Sustainability* and *Institutional Feedback* as integral stages in dissemination. Rogers' model stops at adoption, but the DUCASIF framework demonstrates that sustaining innovation requires mechanisms of feedback and renewal.

At YIT-EDU, sustainability was not achieved by enforcing continuous use of technology but by embedding smart learning principles into institutional systems. Policies mandated at least one smart-learning course per semester, and mentoring programs ensured ongoing support. These measures reflect what Shih & Chang (2020) describes as the "institutionalization" of innovation—when practices are absorbed into the routines and values of the organization.

Institutional feedback then acted as the reflective engine of dissemination. Through analytics dashboards, evaluation meetings, and peer reviews, departments at YIT-EDU gathered and re-shared findings about what worked and what required adjustment. This stage exemplifies *double-loop learning*, where institutions not only correct errors but also reassess their underlying assumptions (Lukic, 2022). In practice, this feedback loop generated new dissemination cycles each semester, ensuring that innovation remained alive and responsive.

The integration of feedback as a formal dissemination phase is one of the most distinctive aspects of the DUCASIF model. It transforms evaluation from a summative process into a generative one—spreading new knowledge, encouraging experimentation, and closing the gap between innovation and everyday teaching. As a result, dissemination at YIT-EDU became a self-sustaining ecosystem supported by policy, reflection, and community ownership.

Theoretical and Practical Implications of the DUCASIF Model

The DUCASIF model offers both theoretical enrichment and practical guidance for educational institutions seeking sustainable innovation. Theoretically, it integrates the logic of *diffusion* (Rogers, 2010; Overbye-Thompson & Hamilton, 2025) with the pedagogy-oriented perspective of *technological integration* (Roblyer, 2018). While Rogers explains how innovations spread, DUCASIF explains how dissemination becomes an institutional learning cycle through sustainability and feedback. It therefore extends diffusion theory by embedding the process within an ecological system of reflection, policy, and collective inquiry.

Practically, the model offers a roadmap for managing educational innovation in contexts similar to YIT-EDU. Institutions can use the five stages—*Understanding, Comprehension, Action, Sustainability,* and *Institutional*

Feedback—as checkpoints to monitor how innovations evolve. For instance, understanding ensures awareness; comprehension builds capability; action fosters implementation; sustainability guarantees endurance; and feedback generates renewal. This cyclical view prevents innovation fatigue by turning dissemination into continuous institutional learning.

Moreover, DUCASIF provides an analytical lens for evaluating the maturity of innovation ecosystems. Universities can assess whether they are stuck in early dissemination stages or have advanced toward reflective feedback and renewal. In doing so, they can design interventions that strengthen collaboration and ensure that technological innovation leads to lasting pedagogical transformation.

In the context of YIT-EDU, the DUCASIF model not only described what happened but also served as a framework for planning future dissemination efforts. It helped the institution see dissemination not as a project that ends, but as a living cycle that sustains innovation through shared learning. This insight may inspire other higher-education institutions in developing regions to view digital transformation as an evolving pedagogical culture rather than a series of discrete initiatives.

Summary of Discussion

In summary, the discussion reveals that dissemination in higher education operates as both a pedagogical and institutional process. The Smart Learning Pedagogical Model at YIT-EDU evolved through stages of understanding, comprehension, action, sustainability, and feedback—each reinforcing the others through cycles of reflection and collaboration. Dissemination thus became a mechanism for continuous renewal rather than a one-time event.

By integrating principles of diffusion, pedagogical integration, and institutional learning, the DUCASIF framework provides a replicable model for fostering innovation that lasts. It emphasizes that sustainable change in education emerges not from technology alone, but from institutions that continuously learn, adapt, and disseminate knowledge within their communities.

Conclusion

This study aimed to address two main research questions: (1) How the Smart Learning Pedagogical Model was disseminated across institutional levels at YIT-EDU (YPUP Institute of Teacher Education, Indonesia), and (2) What was the level and nature of dissemination acceptance among lecturers and students. The findings revealed that dissemination evolved through a five-stage process identified as the DUCASIF Model—Dissemination for Understanding, Comprehension, Action, Sustainability, and Institutional Feedback. This cycle shows that dissemination was not a one-way communication activity but an ongoing system of institutional learning. It progressed from awareness-building to collaborative practice, from individual experimentation to organizational adoption, and finally toward sustainability supported by structured feedback. The DUCASIF framework therefore demonstrates that innovation in higher education grows through interaction, reflection, and policy reinforcement

rather than through isolated training initiatives.

In relation to the second research question, the study found a strong level of dissemination acceptance among lecturers and students. Quantitative results indicated high mean scores for relative advantage, compatibility, and observability, reflecting clear pedagogical benefits and contextual relevance. Qualitative findings complemented this by showing that acceptance emerged through trust, collaboration, and shared ownership of innovation. Dissemination thus became both a pedagogical and cultural process that transformed teaching practices and institutional routines. Overall, the study concludes that sustainable educational innovation depends on an institution's ability to disseminate, internalize, and renew its practices continuously through the stages of the DUCASIF model.

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