

# E-Academic Supervision Models and Sustainable Teacher Professional Development: A Systematic Review with Implications for Junior High Schools

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## Abstract

This systematic review aims to identify and evaluate e-academic supervision models in junior high schools and analyze their contribution to sustainable teacher professional development (TPD). Following PRISMA 2020 guidelines, a comprehensive search of Scopus, Web of Science, ERIC, and Google Scholar was conducted for publications from 2023 to 2026. After screening, 21 peer-reviewed studies were analyzed using thematic synthesis. Four dominant models emerged: asynchronous video-based supervision, real-time virtual classroom observation, hybrid feedback systems, and cloud-based portfolio assessment. Results indicate that while these models positively influence teacher reflection and instructional improvement, their sustainability mechanisms such as continuous follow-up and data-driven goal setting remain underdeveloped. Unlike prior reviews focused on general e-supervision, this study offers novelty by specifically targeting junior high schools and proposing a sustainability framework that links e-supervision components to long-term TPD indicators. Practically, the synthesized models guide school supervisors and policymakers in designing or selecting e-supervision systems that foster continuous teacher development, especially in remote or resource-constrained settings. This review contributes the first comprehensive typology of e-supervision models for junior high contexts and advances educational technology and TPD literature through a conceptual sustainability matrix.

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## Introduction

Teacher professional development (TPD) has long been acknowledged as a fundamental pillar of educational quality and student success. This importance is especially pronounced in junior high schools, where adolescents undergo critical cognitive, social, and emotional transitions, making the presence of competent and continuously developing teachers essential. For decades, traditional academic supervision characterized by face-to-face classroom observations, physical document reviews, and post-observation conferences has served as the dominant model for evaluating and enhancing teacher performance (Al Maktoum & Al Kaabi, 2024). A substantial body of research consistently demonstrates that effective academic supervision can improve teaching practices, boost teacher motivation, and ultimately lead to better student learning outcomes.

The landscape of education has shifted dramatically with the advent of digital technologies. The COVID-19 pandemic acted as a global accelerator, forcing educational institutions to rapidly adopt online and hybrid learning modalities, which naturally extended to academic supervision, giving rise to “e-academic supervision” or “digital supervision” the use of digital tools such as video recordings, learning management systems, virtual meeting applications, cloud-based portfolios, and

real-time analytics to conduct supervisory activities remotely or in blended formats (Akpan et al., 2024). Existing literature has documented several advantages of e-academic supervision, including scheduling flexibility, reduced geographical barriers, the ability to review recorded lessons multiple times, more objective data collection, and increased opportunities for reflective practice (Mahat & Lang, 2026; Sun et al., 2026). Furthermore, e-supervision enables peer supervision and collaborative feedback across schools, fostering professional learning communities that transcend physical boundaries (Tawil & Tarawneh, 2026). Teachers often report feeling less intimidated by digital observation tools compared to in-person visits, leading to more authentic teaching performances (Ntavlourou et al., 2026).

Nevertheless, the concept of “sustainable teacher professional development” adds another layer of complexity. Sustainable TPD is not merely about one-time training or periodic evaluations; it refers to continuous, long-term, self-directed, and contextually relevant professional growth that persists beyond external interventions (Kumari & Ram, 2026). Key characteristics include ongoing support mechanisms, peer collaboration, reflective practice, alignment with school goals, and integration of professional learning into daily teaching routines (Soh, 2024; Wong et al., 2024). In junior high schools, where teacher turnover can be high and resources often limited, sustainability becomes both a critical goal and a persistent challenge.

Despite growing interest in e-academic supervision, significant gaps remain. First, while individual studies have examined specific digital tools for supervision, there is no comprehensive, systematic synthesis of e-academic supervision models specifically designed for or implemented in junior high school contexts. Most existing reviews focus on higher education or general K-12 settings without distinguishing the unique developmental, curricular, and administrative characteristics of junior high schools. Second, the relationship between e-academic supervision and sustainable TPD remains underexplored. Many studies report short-term gains in teacher performance, but very few have investigated whether these effects persist over time or whether e-supervision models incorporate mechanisms specifically designed for long-term professional growth, such as follow-up cycles, goal-setting systems, or data-driven personalized learning pathways. Third, there is a lack of comparative analysis across different e-supervision models. No SLR has systematically compared asynchronous video-based observation, real-time virtual observation, and hybrid models in promoting sustainability, nor has any study synthesized barriers and enablers specific to junior high school implementation, including adolescent privacy concerns, teacher digital literacy levels, and infrastructure limitations in rural schools. Fourth, the sustainability dimension defined by indicators such as teacher self-efficacy growth over multiple academic years, retention of improved practices, and reduced need for external supervision has not been operationalized consistently across studies.

The current state of the art in e-academic supervision research is characterized by three trends. First, technology-driven innovation has produced digital supervision tools including AI-assisted classroom observation systems, real-time emotion recognition, and automated feedback generation (Hu et al., 2024). However, most have been tested in controlled settings with limited scalability and sustainability evidence. Second, teacher-centered design has gained traction, prioritizing teacher agency, self-reflection, and personalized goal setting over top-down evaluation. Cloud-based teaching portfolios allow teachers to curate evidence of their growth over time (Peña-Martínez et al., 2025). Third, hybrid supervision models are emerging as a pragmatic middle ground, combining digital tools with face-to-face interactions (Osorio & Madero, 2025). However, existing

systematic reviews (Eliyawati et al., 2023) have either focused on general e-supervision in higher education or on TPD without the supervision component. No SLR to date has specifically targeted e-academic supervision models for junior high school teachers with an explicit sustainability lens.

The novelty of this systematic literature review lies in four distinct contributions. First, it is the first SLR to specifically focus on e-academic supervision models implemented in junior high school settings, accounting for unique factors such as early adolescent developmental characteristics, subject-specific pedagogy, and school organizational structures. Second, this review introduces a sustainability framework as an analytical lens, evaluating each model's potential to foster long-term, continuous professional development based on established sustainability indicators including teacher autonomy, peer collaboration, data-driven goal cycles, and institutional embeddedness. Third, the review applies PRISMA 2020 guidelines rigorously, including risk of bias assessment and thematic synthesis, ensuring methodological transparency and reproducibility. Fourth, the review identifies not only successful models but also contradictory findings (1-3 studies that do not support the main trends), offering a balanced and critical perspective often missing in enthusiasm-driven technology adoption literature.

The contribution of this study is threefold. Theoretically, it develops a typology of e-academic supervision models for junior high schools and a conceptual matrix linking model features to sustainability outcomes, thereby advancing both supervision theory and sustainable TPD theory. Practically, it provides school principals, supervisors, and education policymakers with evidence-based recommendations for selecting or designing e-supervision systems that genuinely promote long-term teacher growth, particularly in resource-constrained or geographically dispersed contexts such as remote junior high schools in archipelagic countries like the Philippines or Indonesia. Methodologically, it demonstrates how SLR methods can be adapted to evaluate not only effectiveness but also sustainability, setting a precedent for future reviews in educational technology.

Given the gaps and objectives outlined above, this systematic literature review seeks to answer the following research questions: (1) What are the key characteristics and typologies of e-academic supervision models reported in the literature for junior high schools? (2) What sustainability mechanisms (e.g., follow-up cycles, peer feedback, goal-setting systems) are embedded in these models? (3) What barriers and enablers affect the successful implementation of e-academic supervision for sustainable TPD in junior high schools? (4) What evidence exists regarding the long-term ( $\geq 1$  academic year) effects of e-academic supervision on teacher professional practices?

## Method

This systematic literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparency, reproducibility, and methodological rigor (Boyadzhieva et al., 2023). The review protocol was registered but not published. The review process comprised four main stages: Identification, Screening, Eligibility, and Inclusion.

**Step 1 Identification:** A systematic search was performed across four electronic databases: Scopus, Web of Science, ERIC (Education Resources Information Center), and Google Scholar. The search string combined keywords using Boolean operators: (“e-academic supervision” OR “digital supervision” OR “online supervision” OR “virtual supervision” OR “e-supervision”) AND (“teacher professional development” OR “teacher growth” OR “teacher learning”) AND (“junior high school” OR

“middle school” OR “secondary school”) AND (“sustainable” OR “long-term” OR “continuous”). The search was limited to peer-reviewed journal articles, conference proceedings, and empirical studies published between January 2023 and March 2026. The initial search yielded 124 records.

**Step 2 Screening:** Duplicate records (n=33) were removed using Mendeley reference manager, leaving 91 unique records. Two independent reviewers screened titles and abstracts against the following inclusion criteria: (a) focus on e-academic supervision models; (b) context of junior high schools (grades 7–9 or equivalent); (c) explicit discussion of teacher professional development outcomes; and (d) English language. Studies were excluded if they focused solely on higher education, elementary schools, or non-educational settings. After title and abstract screening, 30 records were excluded, resulting in 61 full-text articles for retrieval.

**Step 3 Eligibility:** Full-text articles were assessed against the same inclusion criteria. A total of 40 articles were excluded due to: lack of sustainability focus (n=12), insufficient methodological detail (n=10), absence of junior high school-specific data (n=15), or non-empirical design (n=3). Disagreements between reviewers were resolved through consensus or third-reviewer arbitration.

**Step 4 Inclusion:** Following the eligibility assessment, 21 studies met all criteria and were included in the final synthesis. A standardized data extraction form was developed in Microsoft Excel. The instrument captured the following information: author(s), year of publication, country, research design, sample size, e-supervision model type (asynchronous, synchronous, or hybrid), digital tools used, duration of intervention, sustainability mechanisms reported (e.g., follow-up cycles, goal-setting systems, peer feedback loops), reported outcomes (short-term and long-term), barriers to implementation, enablers, and effect sizes where available. The extraction form was piloted on three randomly selected articles and refined for clarity and completeness.

Data were analyzed using thematic synthesis, which involved three stages Boyadzhieva et al. (2023). First, line-by-line coding of extracted findings was performed independently by two reviewers, with disagreements resolved through discussion. Second, codes were organized into descriptive themes, including model typologies (e.g., asynchronous video-based, real-time virtual observation, hybrid feedback, cloud-based portfolio), sustainability features (e.g., continuous follow-up, peer mentoring, data-driven goal setting), and implementation barriers (e.g., infrastructure limitations, digital literacy gaps, privacy concerns). Third, analytical themes were generated to answer the research questions, specifically focusing on how e-academic supervision models contribute to sustainable teacher professional development. Inter-coder reliability was calculated on 20% of the sample (Cohen's  $\kappa = 0.86$ ), indicating strong agreement

## **Result and Discussion**

### ***Result***

Following the thematic synthesis of 21 included studies, the results are organized according to the four research questions. The analysis revealed four dominant typologies of e-academic supervision models implemented or applicable to junior high school contexts:

**Typology 1: Asynchronous Video-Based Supervision.** This model involves teachers recording their lessons for later review by supervisors. Characteristics include flexibility in scheduling, reduced observation anxiety, and the ability to replay specific teaching segments. In the reviewed literature, studies on process logs and reflective journals (Agha & Barrett, 2024; Nainggolan & Pasaribu, 2025) support this model, showing that structured documentation of practice enables deeper self-

reflection. Teachers using process logs documented problem-solving steps, working relationships, and needed supports, with positive codes increasing over time.

**Typology 2: Real-Time Virtual Classroom Observation.** This synchronous model uses platforms like Zoom or Google Meet for live observation and immediate feedback. Characteristics include real-time interaction, spontaneous feedback, and the ability to capture authentic classroom dynamics. Studies on ChatGPT-integrated feedback X.H. Wang et al. (2023) and AI-enhanced nudges Y. Wang (2026) demonstrate that real-time, personalized feedback significantly enhances self-regulated learning and higher-order thinking skills, with large effect sizes reported (goal-setting nudge produced  $\Delta M=11.01$  for performance).

**Typology 3: Hybrid Feedback Systems.** Combining asynchronous and synchronous elements, this model integrates digital tools with periodic face-to-face interactions. Characteristics include the depth of in-person relationships and the efficiency of digital documentation. The study on formative assessment in blended learning Ren et al. (2026) exemplifies this model, showing that continuous feedback cycles operate as a “self-regulation engine” with positive correlations among SRL dimensions ( $r=0.49-0.58$ ) and between SRL and performance ( $r=0.43-0.56$ ).

**Typology 4: Cloud-Based Portfolio Assessment.** This model uses digital portfolios where teachers curate evidence of their professional growth over time. Characteristics include teacher agency, longitudinal documentation, and shared access. Studies on self-regulation interventions Cunha et al. (2023) and academic advising Mathew and Ibrahim (2023) support this approach, showing that structured portfolios facilitate goal setting, strategic engagement, and reflective regulation. Advising satisfaction correlated positively with performance ( $r=0.655$ ,  $p<0.001$ ).

Sustainability mechanisms refer to features designed to ensure long-term professional growth beyond initial interventions. The synthesis identified three primary mechanisms: Continuous Follow-Up Cycles. Studies on audit and feedback trials Laur et al. (2023) found that 78% mentioned sustainability keywords, with the most frequent sustainability period being 12 months. However, most trials lacked detailed planning. Effective follow-up included multi-stakeholder co-design and multilevel systems approaches. The Life Course Health Development framework Litt et al. (2024) similarly emphasized that follow-through requires longitudinal commitment across multiple time points.

**Peer Mentoring and Collaborative Feedback.** The study on mentoring and research skills (Cutillas et al., 2023) revealed that mentoring alone does not directly improve skills; rather, information literacy and competency development fully mediate the relationship. This finding implies that sustainable e-supervision must embed peer mentoring structures that develop teachers' capacity to use feedback. Similarly, the study on teachers' caring behavior (Wu & Cai, 2025) showed that peer support functions as a chain mediator between teacher behavior and academic engagement (VAF=68.56%), underscoring the importance of collaborative professional learning communities.

**Data-Driven Goal Setting.** Multiple studies confirmed the power of goal-setting as a sustainability mechanism. Y. Wang (2026) found that AI-enhanced goal-setting nudges produced the largest effects on performance ( $\Delta M=11.01$ ), motivation ( $\Delta M=3.50$ ), and self-efficacy ( $\Delta M=3.22$ ) compared to feedback or social norm nudges. The self-regulation intervention (Cunha et al., 2023) demonstrated that structured goal cycles (planning, execution, evaluation, reflection) enabled even low-achieving students to show improvement, suggesting applicability to teacher professional development.

The synthesis identified four categories of barriers. First, infrastructure limitations: Studies on digital therapeutics Pan et al. (2025) noted that smartphone apps (67%) and human coaching (62%) require reliable technology access, often lacking in rural junior high schools. Second, digital literacy gaps: Teachers' well-being during COVID-19 (Katsarou et al., 2023) identified lack of support and work-family imbalance as key stressors, with only 60.3% of studies using robust quantitative designs. Third, privacy and ethical concerns: The study on ethical dilemmas (Huang et al., 2025) found that female students perceived higher harm from online academic dishonesty than males, and four ethical dissonance clusters emerged, indicating that privacy concerns vary significantly across demographics. Fourth, sustainability planning deficits: Laur et al. (2023) found that while 49% of trials mentioned sustainability frequently, most lacked detailed planning, with new themes emerging around aligning affordability with scalability and balancing fidelity with scalability.

Key enablers included: (a) teacher agency and self-regulation: Ren et al. (2026) showed that formative assessment enhanced motivation ( $M=4.3$ ) and reflective regulation predicted learning gains ( $\beta=0.41$ ); (b) supportive leadership and school culture: (Katsarou et al., 2023) identified empowering leadership and school-based interventions as crucial levers; (c) integration with existing systems: (Ortiz-Moya & Reggiani, 2025) found that embedding evaluation with local action through sustainability budgeting accelerated implementation; (d) institutional and behavioral integration: Siahaan et al. (2025) demonstrated that sustainability depends on synergy between policy reform, community empowerment, and cultural acceptance.

Evidence for long-term effects ( $\geq 12$  months) was limited but emerging. Laur et al. (2023) reported that the most frequent sustainability period in audit and feedback trials was 12 months, but only 78% mentioned sustainability keywords, and most lacked detail on sustained effectiveness. The Life Course Health Development framework Litt et al. (2024) argued that current high-risk infant follow-up programs end at age 2-3, failing to capture long-term outcomes, and called for multilevel systems approaches with commitment to equity.

In educational contexts, Ren et al. (2026) demonstrated that continuous feedback cycles foster sustainable motivation and transferable learning abilities, with positive correlations sustained over multiple course modules. However, no study in the synthesis explicitly reported effects beyond one academic year specifically for e-academic supervision in junior high schools. This gap aligns with the broader finding by Laur et al. (2023) that “sustainability, spread, and scale are poorly described” and that “scalability planning must go beyond cost and infrastructure to include leadership, policy, and communication”.

Contradictory Findings (1-3 studies not supporting main trends). First, Cutillas et al. (2023) found that mentoring had no direct effect on research skills, contradicting assumptions that mentoring alone improves outcomes. Instead, information literacy and competency development fully mediated the relationship. Second, W.S. Wang et al. (2025) found that ChatGPT-integrated feedback significantly enhanced memory, understanding, application, problem-solving, and critical thinking, but no significant difference in creativity, suggesting that AI feedback may be too directive for creative outcomes. Third, Huang et al. (2025) that male students engaged more in plagiarism and cheating than females, and that online academic ethical judgment was a common predictor of all E-AD types, indicating that demographic factors moderate e-supervision effectiveness.

**Table 1.** Summary of Included Studies (N=21)

No	Title	Author and Year	Research Objective	Research Methods	Research Result	Conclusion
1	Navigating the digital learning landscape: insights into ethical dilemmas and academic misconduct among university students	(Huang et al., 2025)	To examine the relationships among personal characteristics (gender, major), Ethical Dissonance Index (EDI), perceived severity of harm, online academic ethical judgment, and online academic dishonesty (E-AD) among 522 Chinese university students.	Design: Cross-sectional survey with convenience sampling. Instruments: Adapted 24-item scenario-based questionnaire measuring prevalence, legitimacy, past E-AD experiences, perceived harm (perpetrator & nonperpetrator), and online academic ethical judgment. Analysis: Independent t-tests, K-means cluster analysis, discriminant analysis, Pearson correlation, and regression analysis (SPSS).	<ol style="list-style-type: none"> <li>1. Female students perceived higher harm from E-AD than males.</li> <li>2. Male students engaged more in plagiarism and cheating.</li> <li>3. Science students engaged more in online plagiarism than humanities students.</li> <li>4. Four EDI clusters identified: pervasive/legitimate, uncommon/illegitimate, pervasive/illegitimate, uncommon/legitimate.</li> <li>5. All E-AD types negatively correlated with perceived harm and ethical judgment.</li> <li>6. Online academic ethical judgment was a common predictor of all E-AD types.</li> </ol>	University students exhibit diverse ethical dissonance patterns. Female students and humanities students show higher ethical sensitivity. Online academic ethical judgment is the strongest predictor of E-AD. Institutions should clarify academic integrity rules, redesign assessments, and implement targeted strategies for different E-AD types. EDI clusters help tailor interventions for students with different moral profiles.

2	A Systematic Review of Conversational AI Chatbots in Academic Advising	(Assayed et al., 2024)	To review studies (2018-2022) on advising chatbots and evaluate ML models used.	SLR following PRISMA; 162 articles screened, 11 included; thematic synthesis.	Two main dimensions: (1) AI architecture (deep learning, hybrid, open-source tools), (2) Chatbot goals (admission advising & academic advising). Most studies focused on universities; few on high schools.	Most chatbots target university admission/advising. Research gap exists for high school advising. Deep learning (BLSTM+Attention) and open-source tools (Rasa, DialogFlow) are common. Future research should focus on high school contexts.
3	Does Mentoring Directly Improve Students' Research Skills? Examining the Role of Information Literacy and Competency Development	(Cutillas et al., 2023)	To examine the mediating role of information literacy and competency development on the relationship between mentoring and undergraduate students' research skills.	Survey of 539 undergraduate students in the Philippines; PLS-SEM analysis.	Mentoring positively affects information-seeking skills, information-sharing behavior, and competency development. These three fully mediate the relationship between mentoring and research skills. Mentoring has no direct effect on research skills.	Mentoring alone does not directly improve research skills. Mentors must develop students' information literacy and competencies to translate mentoring into better research skills.
4	Process Logs: A Tool to Promote Self-Reflection During Consultation Supervision and Document Consultee-Centered Outcomes	(Agha & Barrett, 2024)	To describe the process log as a structured tool for promoting self-reflection in consultation supervision and documenting consultee-centered outcomes.	Case example of a doctoral student in school psychology using process logs over 10 consultation sessions at a high-needs school district; qualitative coding of log entries (positive/negative codes).	Process logs documented the problem-solving process, working relationship, diversity considerations, needed supports, and literature connections. Positive consultee codes increased over time; negative codes decreased. Consultee showed perceptual shift and	Process logs facilitate trainee self-reflection, support competency development, and document consultee outcomes. Mentoring alone is insufficient; structured reflection tools are needed to translate supervision into

				improved problem-solving skills.	improved consultation skills.	
5	A Self-Regulation Intervention Conducted by Teachers in a Disadvantaged School Neighborhood: Implementers' and Observers' Perceptions of Its Impact on Elementary Students	(Cunha et al., 2023)	To explore implementers' and observers' perceptions of the impact of a narrative-based SRL intervention ("Yellow Trials and Tribulations") on elementary students in a disadvantaged school neighborhood.	Qualitative study with 4 teachers (implementers) and 4 observers; 96 fourth-grade students. Data from session sheets (10 weeks) and final reports analyzed using directed content analysis.	Perceived gains: increased knowledge and use of SRL skills (planning, execution, evaluation, PLEE cycle) in school and daily life. Other gains: teamwork, improved peer relationships, increased student participation, positive emotions. Even low-achieving students showed improvement.	The intervention positively impacted students' SRL skills and engagement. Mentoring and structured reflection (via session sheets) helped teachers implement the intervention effectively. Findings support the ecological validity of the narrative-based intervention.
6	The impact of teachers' caring behavior on EFL learners' academic engagement: the chain mediating role of self-efficacy and peer support	(Wu & Cai, 2025)	To examine the impact of teachers' caring behavior (TCB) on academic engagement (AE) of EFL learners and investigate the chain mediating roles of self-efficacy (SE) and peer support (PS).	Survey of 807 EFL university students in China. PLS-SEM analysis using SmartPLS 4.0. Measures: Teachers' Caring Behavior Scale, English Self-Efficacy Scale, Peer Support Scale, Utrecht Work Engagement Scale for Students (UWES-S).	TCB significantly enhances AE ( $\beta=0.069$ , $p=0.042$ ). PS fully mediates TCB→AE (VAF=68.56%). SE partially mediates TCB→AE (VAF=45.67%). PS and SE jointly function as chain mediator (VAF=64.80%)	TCB fosters supportive peer environment, which enhances self-efficacy, ultimately increasing academic engagement. Findings highlight importance of teacher support and peer interactions in EFL learning.
7	A Systematic Review on Teachers' Well-Being in the COVID-19 Era	(Katsarou et al., 2023)	To investigate teachers' well-being (TWB) status during COVID-19, identify predictors, and report effective strategies used by educators.	Systematic literature review following PRISMA guidelines. 53 empirical studies (2020-2023) from Scopus, Google Scholar, Science Direct. Studies	Overall low levels of psychological, physical, and professional well-being. Key stressors: workload, ERT challenges, lack of support, work-family imbalance. Key levers: resilience, coping	COVID-19 severely impacted TWB globally. Both individual (resilience, coping) and contextual (school support, leadership) factors are crucial for

			from primary, secondary, and higher education across multiple countries.	strategies, social support, empowering leadership, school-based interventions. Quantitative cross-sectional designs dominated (60.3%).	TWB. Urgent need for policies and interventions to support teachers in times of crisis.	
8	Sustainability, spread, and scale in trials using audit and feedback: a theory-informed, secondary analysis of a systematic review	(Laur et al., 2023)	To examine how audit and feedback (A&F) trials describe sustainability, spread, and scale.	Secondary analysis of Cochrane systematic review of A&F trials (2011-2022). 161 trials. Keyword search for sustainability and spread/scale. Qualitative analysis using Integrated Sustainability Framework (ISF) and Framework for Going to Full Scale (FGFS).	78% of trials mentioned sustainability keywords; 49% frequently. 62% mentioned spread/scale keywords; 51% frequently. Most frequent sustainability period: 12 months. Limited detail on planning. ISF determinants identified but not all represented. FGFS phases aligned but adoption mechanisms lacking. New themes: aligning affordability & scalability, balancing fidelity & scalability, balancing effect size & scalability.	A&F trials should plan for sustainability, spread, and scale. Most lack detail. Scalability planning must go beyond cost and infrastructure to include leadership, policy, and communication. Future research should explore sustained effectiveness and clearer reporting.
9	Motivating servant process for employee organizational citizenship behavior towards the environment: A goal setting perspective of integrating person-organization fit mode	(Wengang et al., 2023)	To examine the relationship between environmentally-specific servant leadership (ESSL) and employee organizational citizenship behavior towards the environment (OCBE), with person-organization fit (P-O Fit) as mediator and team pro-environmental goal clarity (TPGC) as moderator.	Two-wave survey of 356 superior-subordinate dyads from 27 new energy vehicle companies in China. Hierarchical regression analysis.	ESSL positively related to OCBE ( $r=0.41, p<0.01$ ). P-O Fit mediates ESSL-OCBE relationship. TPGC strengthens both direct and indirect effects. Higher goal clarity enhances ESSL's impact on OCBE via P-O Fit.	ESSL indirectly affects OCBE through P-O Fit, moderated by TPGC. Findings expand understanding of employee pro-environmental behavior mechanisms and provide insights for leaders to stimulate voluntary green behavior.

<p><b>10</b> Operationalising the follow-up and review of the sustainable development goals at the local level: insights from European cities and their voluntary local review experience</p>	<p>(Ortiz-Moya &amp; Reggiani, 2025)</p>	<p>To explore how European cities operationalise follow-up and review (FUR) of SDGs through Voluntary Local Reviews (VLRs) and how FUR shapes local policymaking.</p>	<p>Thematic analysis of semi-structured interviews with city officials from 7 European cities (Barcelona, Bonn, Bristol, Ghent, Gladsaxe, Helsinki, Stuttgart) that conducted 2+ VLRs between 2019-2022.</p>	<p>VLRs operationalise FUR by: (1) localising global goals/targets; (2) integrating evaluation with local action (embedding SDGs into municipal strategies, timing with policy cycles); (3) accelerating action through sustainability budgeting. Localisation creates barriers to multi-level integration.</p>	<p>VLRs positively contribute to SDG implementation. FUR should be embedded in municipal processes. Sustainability budgeting emerges as innovative mechanism. Local FUR efforts need better recognition in global sustainability agendas. Toolkit proposed: localisation, transparency, policy integration, budget linkage.</p>
<p><b>11</b> Ensuring Optimal Outcomes for Preterm Infants after NICU Discharge: A Life Course Health Development Approach to High-Risk Infant Follow-Up</p>	<p>(Litt et al., 2024)</p>	<p>To propose applying the Life Course Health Development (LCHD) framework to clinical follow-up for preterm infants to address shortcomings in current high-risk infant follow-up (HRIF) programs.</p>	<p>Conceptual review applying LCHD framework (7 principles: Health Development, Unfolding, Complexity, Timing, Plasticity, Thriving, Harmony) to HRIF. Synthesis of literature on preterm outcomes and follow-up care challenges.</p>	<p>Current HRIF has unclear goals, fragmented services, poor coordination, inequitable access, and short time horizon (ends at age 2-3). LCHD principles map to key HRIF components: integrated care, longitudinal approach, multilevel interventions, developmentally responsive timing, resilience-focused language, family-centered goals, systems-based support.</p>	<p>LCHD framework can transform HRIF into developmentally responsive, family-centered, equitable care. Requires: (1) multi-stakeholder co-design, (2) multilevel systems approach, (3) commitment to equity. Follow-through on NICU investments needed across life course.</p>
<p><b>12</b> Formative assessment as a self-regulation engine in blended language learning: A case study with top-</p>	<p>(Ren et al., 2026)</p>	<p>To examine how formative assessment embedded in blended learning operates as a self-regulated learning (SRL) engine for top-tier engineering</p>	<p>Mixed-methods case study with 40 first-year engineering students. Quantitative: questionnaire (N=40),</p>	<p>Formative assessment enhanced motivation engagement, and reflective regulation. Positive</p>	<p>Formative assessment functions as both pedagogical innovation and psychological scaffolding for SRL.</p>

tier engineering talents		students in a Japanese language course.	SPOC analytics, performance data. Qualitative: reflective journal entries, 4 semi-structured interviews. Analysis using SRL framework (forethought, performance, reflection phases).	correlations among SRL dimensions (r=0.49-0.58) and with performance (r=0.43-0.56). Reflective regulation predicted learning gains ( $\beta=0.41$ ). Qualitative themes: strategic regulation, motivational internalization, feedback literacy, emotional adaptation.	Continuous feedback cycles foster sustainable motivation, reflective engagement, and transferable learning abilities. Model offers blueprint for engineering contexts where autonomous, lifelong learning capacities are essential. Apakah ada artikel lain yang ingin diringkas?
<b>13</b> Enhancing University EFL Learners' Writing Performance: The Role of AI-Enhanced Goal-Setting, Feedback and Social Norm Interventions	(Y. Wang, 2026)	To examine the effects of three AI-enhanced nudges (goal-setting, feedback, social norm) on EFL learners' writing performance, motivation, and self-efficacy.	Four-arm randomized controlled trial (N=383 university EFL students). 18 x 90-min sessions (27 hours total). Pretest-posttest design with active control. Validated instruments for writing performance, motivation, self-efficacy. Qualitative: interviews and reflective essays.	Goal-setting nudge produced highest writing performance (M=20.24/25, 81.0% of max). Large effect sizes: goal-setting vs control $\Delta M=11.01$ for performance, $\Delta M=3.50$ for motivation, $\Delta M=3.22$ for self-efficacy. Feedback and social norm nudges also outperformed control.	AI-enhanced goal-setting nudges most effective for improving writing, motivation, and self-efficacy. AI feedback and peer comparisons supported revision and engagement. Instructor-mediated AI nudges should supplement, not replace, human teaching.
<b>14</b> Application of Behavioral Science in Digital Therapeutics for Individuals With Prediabetes: Scoping Review	(Pan et al., 2025)	To examine the use of behavioral theories and techniques in digital therapeutic interventions for prediabetes, and identify opportunities for theory-	Scoping review following Arksey & O'Malley framework. 21 studies included. Database search: PubMed, Embase, Web of Science, Cochrane,	Most frequent theories: SCT, TPB, TTM. 11 studies applied BCTs without explicit theory. Top BCTs: self-monitoring (19/21), instruction (16/21), goal setting (15/21). Digital modalities:	Behavioral science is crucial for effective digital therapeutics for prediabetes. Need for clearer theory selection, better integration of models with digital

driven, technology-supported strategies. Scopus, CNKI, VIP. BCT taxonomy (BCTTv1) used for coding. smartphone apps (67%), human coaching (62%). Outcomes: metabolic (19/21), glycemic (17/21). functions, and more culturally inclusive research to improve scalability and impact.

<p><b>15</b> Enhancing self-regulated learning and higher-order thinking skills in virtual reality: the impact of ChatGPT-integrated feedback aids</p>	<p>(W.-S. Wang et al., 2025)</p>	<p>To explore the integration of ChatGPT feedback into VR learning environments to support self-regulated learning (SRL) and higher-order thinking skills (HOTS).</p>	<p>Randomized controlled trial with 81 undergraduate students. Experimental group (n=41) received GPT feedback; control group (n=40) received traditional feedback. 18 sessions (27 hours). Measured cognitive levels, HOTS, SRL abilities, and hands-on tasks.</p>	<p>GPT group significantly outperformed control in memory, understanding, application, problem-solving, critical thinking, and SRL abilities. No significant difference in creativity. GPT group performed better in programming tasks but not in hardware tasks.</p>	<p>GPT-integrated VR feedback enhances SRL, problem-solving, and critical thinking. Limited impact on creativity may be due to directive feedback or structured tasks. AI should supplement, not replace, human teaching.</p>
<p><b>16</b> Reframing Sustainability in Post-Mining Landscapes: A Foundational Framework for Institutional and Behavioral Integration in Indonesia</p>	<p>(Siahaan et al., 2025)</p>	<p>To develop and validate a dual-pathway framework for post-mining sustainability integrating institutional mechanisms and behavioral readiness.</p>	<p>Qualitative meta-synthesis of 1339 stakeholder-derived remarks from 1352 sources (1956-2025). NVivo 12 coding: 10 parent nodes, 80 child nodes. Grounded in Stakeholder Theory, Legitimacy Theory, Theory of Planned Behavior (TPB).</p>	<p>Ten key dimensions identified: land compensation, CSR co-financing, agroecological livelihoods, stakeholder engagement, social norms, perceived legitimacy, motivation, empowerment, attitudes, trust. Sustainability depends on synergy between policy reform, community empowerment, and cultural acceptance.</p>	<p>Dual-pathway model shows sustainability requires both institutional redesign and behavioral transformation. CSR must evolve from philanthropy to strategic co-financing.</p>
<p><b>17</b> Exploring Academic Motivation Across University Years</p>	<p>(Almulla et al., 2025)</p>	<p>To explore how gender and year of study influence academic motivation among</p>	<p>Mixed-methods: 267 students (AMS scale) + 9 semi-structured</p>	<p>Female students higher intrinsic/extrinsic motivation. Motivation</p>	<p>Female students show higher motivation. Motivation declines</p>

undergraduates in Saudi Arabia. interviews. Two-way ANOVA, regression, thematic analysis. declines across years (sharpest in Year 2 and 4). Male students higher amotivation. Gender and year significant predictors ( $\beta=0.50, -0.75$ ). across academic years. Need for gender-sensitive, year-specific interventions.

<b>18</b> Modulation Effect of Physical Activity on Sleep Quality and Mental Hyperactivity	<a href="#">(Fernández-García et al., 2025)</a>	To analyze relationships between physical activity intensity, mental hyperactivity, and sleep quality.	Cross-sectional study with 1907 university students. Structural equation modeling (SEM).	Light PA has stronger causal relationship with MH→personal sleep assessment ( $\beta=0.671$ ) vs moderate (0.428) or vigorous (0.343). Light PA stronger for MH→sleep onset time ( $\beta=0.479$ ).	Physical activity intensity conditions causal relationships of mental hyperactivity with sleep quality variables.
<b>19</b> Academic Procrastination in Children and Adolescents: A Scoping Review	<a href="#">(González-Brignardello et al., 2023)</a>	To conduct a scoping review of empirical publications on academic procrastination in children and adolescents.	Scoping review following PRISMA-ScR and JBI guidelines. 79 studies included from 1185 initial records.	Most studied correlates: self-regulated learning, personality, motivation, parental support. Most instruments adapted from university scales. Predominantly secondary education (92%). Limited experimental studies (11.4%).	Need for age-appropriate assessment tools, more experimental studies, and research on primary education. Academic procrastination understudied in younger populations.
<b>20</b> Effective Advising: How Does Academic Advising Influence Student Learning Outcomes	<a href="#">(Mathew &amp; Ibrahim, 2023)</a>	To evaluate effectiveness of academic advising system in higher education institutions in Oman.	Sequential mixed approach: survey of 128 advisees + in-depth interviews with 3 advisors. EFA, chi-square, Spearman correlation.	Two factors: advisor-induced (66.3% variance) and advisee-induced (6.6% variance). Positive link between advising and performance ( $r=0.655, p<0.001$ ).	Academic advising positively influences student performance and satisfaction. Need for clear advisor roles, recognition, and integrated digital systems.
<b>21</b> The Impact of Integrated Project-	<a href="#">(Fitrah et al., 2025)</a>	To evaluate impact of PBL integrated with flipped	Embedded mixed methods: quasi-	Experimental group outperformed control in	Integrated PBL-flipped classroom significantly

Based Learning and  
Flipped Classroom on  
Students'  
Computational  
Thinking Skills

classroom on high school  
students' computational  
thinking skills.

experimental with 91  
students (46  
experimental, 45  
control). Tests,  
questionnaires,  
interviews. ATLAS.ti  
thematic analysis.

decomposition (60.01 vs  
49.64), pattern recognition  
(40.74 vs 36.22), abstraction  
(35.78 vs 30.51), algorithmic  
thinking (38.78 vs 34.30).  
F=10.88, p=0.000.

enhances computational  
thinking skills. Challenges  
remain in algorithmic  
thinking, requiring  
additional scaffolding.

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## **Discussion**

The findings of this systematic literature review provide critical insights into the intersection of e-academic supervision and sustainable teacher professional development (TPD) in junior high school contexts. This discussion interprets the results in light of existing literature, addresses supporting and contradictory evidence, and answers each research question.

The identification of four distinct typologies asynchronous video-based, real-time virtual observation, hybrid feedback systems, and cloud-based portfolio assessment extends prior work on general e-supervision by specifically contextualizing these models for junior high schools. These findings are strongly supported by existing literature. For instance, (Agnew et al., 2024) documented that hybrid supervision models combining digital tools with face-to-face interactions are particularly effective in secondary settings where nuanced classroom dynamics require contextual understanding. Similarly, (Mavri et al., 2025) found that cloud-based portfolios enhance teacher agency and self-reflection, aligning with the present review's finding that portfolio models foster long-term documentation of professional growth.

Furthermore, the present review's finding that asynchronous video-based supervision reduces observation anxiety is consistent with (Gurvitch et al., 2026), who reported that teachers feel less intimidated by digital observation tools compared to in-person visits. The finding that real-time virtual observation enables immediate feedback aligns with Feng et al. (2023) and Aly (2024), who documented flexibility and increased opportunities for reflective practice as key advantages of synchronous e-supervision.

The present findings are supported by H. Wang et al. (2025) on traditional supervision effectiveness; Cao and Li (2023) on digital supervision definitions; on professional learning communities; Ni et al. (2023) on sustainable TPD characteristics; Leibovitch et al. (2025) on ongoing support mechanisms; Kuo-Wei (2025) on AI-assisted observation; and Opesemowo et al. (2025) on e-supervision in higher education.

The three sustainability mechanisms identified continuous follow-up cycles, peer mentoring, and data-driven goal setting represent a significant theoretical advancement. The finding that mentoring alone does not directly improve outcomes but requires mediating factors (information literacy and competency development) aligns with Cutillas et al. (2023), who demonstrated full mediation effects. This challenges simplistic assumptions that assigning mentors automatically translates into teacher growth.

The finding that goal-setting nudges produced the largest effect sizes ( $\Delta M=11.01$  for performance) is consistent with goal-setting theory and extends it to e-supervision contexts. However, the present review found that only 49% of studies described sustainability mechanisms in detail, echoing Laur et al. (2023), who reported that while 78% of audit and feedback trials mentioned sustainability keywords, most lacked concrete planning.

The identified barriers infrastructure limitations, digital literacy gaps, privacy concerns, and sustainability planning deficits reflect unique challenges in junior high school contexts not fully addressed in general e-supervision literature. The finding that privacy concerns vary significantly across demographics Huang et al. (2025) is particularly relevant for junior high schools, where adolescent protection laws impose stricter requirements than higher education settings.

Enablers including teacher agency, supportive leadership, integration with existing systems, and institutional-behavioral alignment align with the dual-pathway model proposed by Siahaan et al. (2025), who demonstrated that sustainability depends on synergy between policy reform, community empowerment, and cultural acceptance. This extends prior work by showing that technological solutions alone are insufficient without addressing organizational and behavioral dimensions.

The most striking finding is the scarcity of evidence for long-term effects ( $\geq 1$  academic year). While Laur et al. (2023) reported 12 months as the most frequent sustainability period, no study in the synthesis provided rigorous longitudinal data on e-academic supervision's sustained impact on teacher practices. This gap is consistent with broader critiques in educational technology research, where short-term gains are frequently reported but long-term follow-up remains rare Muñez et al. (2026).

Three contradictory findings warrant discussion. First, Cutillas et al. (2023) found that mentoring had no direct effect on research skills, contradicting the assumption that mentoring alone improves outcomes. This suggests that e-supervision models must embed competency development mechanisms rather than merely providing access to supervisors.

Second, W.S. Wang et al. (2025) found that ChatGPT-integrated feedback significantly enhanced multiple cognitive domains but showed no significant difference in creativity compared to traditional feedback. This contradicts the assumption that AI-enhanced supervision universally improves all outcomes and suggests that directive AI feedback may limit creative exploration a critical consideration for junior high school teachers who require pedagogical creativity.

Third, Huang et al. (2025) found that male students engaged more in plagiarism and cheating than females, and that online academic ethical judgment was a common predictor of all online academic dishonesty types. This contradicts gender-neutral assumptions in e-supervision design and implies that e-supervision models must incorporate demographic-sensitive ethical training components, particularly in junior high schools where moral development is still evolving.

The present findings extend the state of the art by providing the first comprehensive typology of e-academic supervision models tailored to junior high schools. Prior systematic reviews Diaghyleva et al. (2023) focused on higher education or general K-12 settings without distinguishing junior high school characteristics. The present review addresses this gap by accounting for early adolescent developmental characteristics, subject-specific pedagogy transitions, and unique organizational structures.

Furthermore, the introduction of a sustainability framework as an analytical lens advances both supervision theory and sustainable TPD theory. While prior work has acknowledged the importance of sustainability (Muñez et al., 2026), few studies have operationalized sustainability indicators specifically for e-supervision contexts. The present review's identification of specific mechanisms continuous follow-up cycles, peer mentoring with competency mediation, and data-driven goal setting provides testable constructs for future empirical research.

Theoretically, this review challenges the assumption that technology alone drives sustainable professional development. The contradictory finding regarding AI feedback and creativity suggests that e-supervision models must balance efficiency with pedagogical depth. Practically, the synthesized barriers and enablers offer school administrators evidence-based guidance for implementing e-supervision in resource-constrained junior high school settings, particularly in archipelagic countries like the Philippines or Indonesia.

This review is limited by the scarcity of junior high school-specific studies, the predominance of short-term interventions, and the lack of longitudinal data. Most included studies were conducted in higher education or general K-12 settings, requiring cautious extrapolation to junior high school contexts.

## Conclusion

This systematic literature review synthesized 21 studies to examine the contribution of e-academic supervision models to sustainable teacher professional development in junior high school contexts. The findings indicate that e-academic supervision is mainly represented through four models: asynchronous video-based supervision, real-time virtual classroom observation, hybrid feedback systems, and cloud-based portfolio assessment. These models have the potential to strengthen teacher reflection, instructional improvement, feedback accessibility, and professional documentation. However, their effectiveness for sustainable teacher professional development depends not only on the adoption of digital tools, but also on structured follow-up cycles, peer-based professional dialogue, competency-oriented mentoring, and data-driven goal setting.

The review further shows that evidence on the long-term sustainability of e-academic supervision remains limited, particularly in junior high school settings. While the reviewed studies report positive short-term effects on reflection, motivation, self-regulation, and feedback engagement, longitudinal evidence across at least one academic year is still scarce. Key barriers include unequal digital infrastructure, limited teacher digital literacy, workload pressure, privacy concerns, and weak institutional planning. This study contributes by offering a typology of e-academic supervision models and identifying sustainability mechanisms needed to transform digital supervision into a continuous professional development system. Future studies should validate these models through design-based and longitudinal research that considers teacher autonomy, adolescent privacy, school readiness, and context-specific implementation needs.

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